

Rendezvous

VOLUME 3 ISSUE 3 FALL 2009

Where today meets tomorrow

Transition at the Cape

Changing Tides on
the Space Coast as shuttle
winds down and Constellation
ramps up.

Transition at the Cape

Shifting sands on the Space Coast as shuttle winds down and Constellation ramps up.

Outside the Gates

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TRANSITION & Retirement

COMMENTS? QUESTIONS?

Please send us your feedback.

<http://rendezvous.jsc.nasa.gov>

PICTURED ABOVE: Space Shuttle Endeavor sits on Launch Pad 39A.



From Leadership

This past summer has been an incredibly busy and emotional time for all of us supporting the Space Shuttle Program. We flew our last mission to the Hubble Space Telescope, conducted several record-setting spacewalks and achieved our objectives on the STS-125, STS-127 and STS-128 missions. At Stennis, we conducted the last planned test of a space shuttle main engine. At Michoud, the last major weld has been completed and the final six external tanks are in various stages of production. In Utah, the final mixing and casting for the space shuttle solid rocket motors has been completed. At Kennedy, we're already seeing changes in the shuttle processing and launch operations landscape. With this last mission safely landed on Sept. 11, we have only a half-dozen missions left before we're scheduled to park the orbiters for good and look to the next era in our human spaceflight program.

This is, of course, unless the options tendered by the Review of U.S. Human Space Flight Plans Committee, more familiarly known as the Augustine committee, lead us in another direction. But until NASA has different direction, our shuttle workforce must keep our collective focus on flying out our remaining missions safely. This is a task that comes naturally to us. After all, we've been doing it for more than three decades, and there is no better-trained or more capable spaceflight workforce in the world or in history.

As we successfully complete each milestone and shuttle mission, we need to congratulate each other. Our achievements are many and significant, and have provided us with the foundation of knowledge needed to continue this grand adventure of human exploration of space.

These final steps are difficult as we experience the inevitable reductions in workforce that are a consequence of any program's sunset. We are already seeing members of our extended teams leaving the space program entirely, entering retirement, or reassigned to other programs. Reductions in the shuttle contractor workforce at Lockheed Martin, Boeing, Pratt Whitney Rocketdyne, United Space Alliance, Alliant Techsystems and many, many others are hard on all of us. We are breaking up a family that has worked exceedingly hard for several decades to design, build, and operate the world's most capable reusable space transportation system.

The last six flights will be bittersweet because the team that made them possible will no longer be together. But we

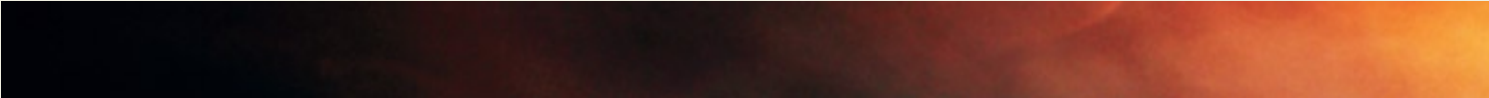
From Leadership

continue to be grateful to the team that has built and operated our shuttle system for thirty years. We thank you for all you've done to help us get to where we are today. The country, the agency and the program owe you a debt of gratitude. We couldn't have done it without you.



Dorothy Rasco

Manager, Space Shuttle Business Office
SSP T&R Lead
Johnson Space Center



From the Editor

It's hard to accept, but 2010 is only three months away, and we have only six shuttle missions left in the long life of our program. Retirement of the shuttle fleet and many of its assets is approaching at breakneck speed, and transition to the future is upon us. That reality is what this issue of Rendezvous is all about.

In our cover story about Kennedy Space Center, where transition is actually visible, we talked to the people on the front lines of change in center leadership and in human resources, as well as the transition managers for ground operations for all three programs — shuttle, station and Constellation. Then, in a companion piece, we talked to the state, municipal and community organizations that are preparing for and supporting workforce transition “Outside the Gates” of many NASA centers.

This issue's T&R Progress Report covers a variety of pivotal Constellation component testing activities, the mission of the Review of U.S. Human Space Flight Plans Committee (by Norm Augustine) assembled by President Obama and the appointment of the agency's new leadership — NASA Administrator Charlie Bolden and Deputy Administrator Lori Garver. In “Space Generations: The Seasoned Workforce,” the first article in a three-part series, we honor and examine the legacy of our shuttle veterans and ask what's next for our program's graybeards.

Looking forward as we do with each issue into Constellation development, we sat down with the Constellation Space Suit System team to get an accurate picture of the challenges faced in designing and building the next generation spacesuits. We enjoyed a lengthy chat about preparing for shuttle retirement with Dave Pitre, who currently hangs his hat in the simulation lab at Johnson Space Center and has worked on the Space Shuttle Program since STS-1.

Finally, in Weighing In, the column that serves as our version of letters to the Editor, we're reaching out to more of you with several new tools on the Rendezvous website. Look for our Transition Poll and Digital Scrapbook additions and use them to give us your feedback and memories of the shuttle program.

As always, we encourage you to use the feedback button to tell us what you think or comment on anything you see here. And please don't forget to subscribe if you haven't already. We look forward to hearing from you.

Enjoy!



TRANSITION

AT THE CAPE

Demolition and construction activities are hard to miss. Especially if you've also been keeping your eye on the calendar of remaining scheduled missions for the Space Shuttle Program. Or if you've been monitoring the widening gap between the last shuttle flight and the first manned Constellation flight to the International Space Station. Demolition and construction activities are an indication that something's happening.

This is the reality at Kennedy Space Center. In the last year or so, modifications began at Launch Complex 39, construction began on the new mobile launcher platform, and an area in the Launch Control Center was reconfigured into the new program's firing room. But those were just the obvious alterations.

That's not all that's changing at Kennedy. Transition is much more than tearing down the old, storied facilities and building new ones or repurposing existing structures and equipment.

Stand still, lose ground

The folks at Kennedy Space Center didn't wait to get started on their transition planning. The Vision for Space Exploration was announced in January 2004, and even before they were actually asked to address it in the regular budgeting process, Kennedy had generated a cost impact study for transition. They parametrically estimated what it would cost to close out the shuttle program based on the closure of the SpaceLab project experienced by Kennedy's payload community. Their initial estimate, as one would assume, was quite high. But in the past four years, they've worked to refine the cost estimating process by eliminating unnecessary requirements and reducing the cost of excessing equipment.

Besides helping them understand the enormity of the task ahead, getting a jump on the task also helped cement the symbiotic relationship between the institutional side of Kennedy, the Space Shuttle Program, the International Space Station Program and the Constellation Program.

"The programs are well tied together here," explained Mike Wetmore, associate director for Engineering and Technical Operations at Kennedy. "We're working to ensure a safe and effective turnover of the processing facilities and ground operations that need to be shared."

At the same time, they're also trying not to retain anything that won't be required for the next program, because one of the agency's Earth-bound goals is to support the Constellation Program more inexpensively than they do the shuttle program.

Certainly change is never easy, but change of this magnitude is downright daunting.

"So we work closely to give them what they need and get ready to excess the rest," Wetmore continued. "But we have to keep our eye on the ball and ensure that shuttle is our first priority and transition to Constellation is second."

That's a tall order — and a hugely complex one, too. Certainly change is never easy, but change of this magnitude is downright daunting.

"We're changing virtually everything about the way we do business right now," Wetmore elaborated.

Traditionally, the centers and their project contractors are relatively self-sustaining, which fosters relationships of mutual independence. But budget constraints, the nature of the Constellation Program and the goal of lean operation are already changing that model. There have been discussions about potentially bringing the program office for Ares operations to Kennedy, and about strengthening the flight hardware-sustaining role at the center instead of relying upon Marshall and Johnson Space Centers for those activities. Those are big changes, but they're just a few of many.

Matrixed for efficiency

In the not-so-distant past, shuttle processing included all of engineering and safety and mission assurance, in addition to all of the operations folks — more than 500 people. Two years ago, they formed a matrix engineering organization. That left the logistics, operations and project management function in a single, large shuttle project office — still about 160 people.

At other centers around the country, project offices are relatively small in comparison and get almost all of their support matrixed to them from other organizations, such as the mission operations directorate (MOD), the flight crew office or safety and mission assurance, for example. Wetmore recalled the difficulties in trying to grow a Constellation project office that mirrored the traditional Kennedy way.

"We just did not have enough bodies to fly out shuttle, continue to process station and to fully staff up Constellation," said Wetmore, referring to the problem of maintaining dedicated teams for each



An orbiter is prepared by its ground processing crew to be moved from the orbiter processing facility to the Vehicle Assembly Building.

program. “Bob Cabana, our new center director, told us to look at the MOD model to see if there’s a benefit to having a ground processing organization to provide processing services as needed to all of our projects.”

So that’s what they did. And they brought a proposal back to Kennedy’s management council recommending the creation of a ground processing directorate that would handle processing for all projects — shuttle closeout, transition, orbital replacement units bound for station, operations concept development for Constellation, or operating the new systems already delivered. It was elegant, and it was needed — one ground processing organization to execute missions for shuttle, station and, eventually, Constellation.

“That’s what we’re doing right now,” Wetmore added. “But we have to reorganize in the midst of continuing to safely process shuttle, process station and develop Constellation.”

... this kind of matrix support concept represented a significant shift in the Kennedy operational culture ...

Easier said than done, he admitted. The plan, when finalized, will clearly show when property and functions can be phased out of programs as they close and then incorporated into the ground processing directorate for future projects — all without negatively impacting any project or anybody. Wetmore emphasized that this kind of matrix support concept represented a significant shift in the Kennedy operational culture, and it was an internal Kennedy decision that was driven by the demands of transition.



The three meanings of transition

Transition means different things to different people in different programs. Defined literally, it is the process of change or change between phases. But it’s the nature and scope of change that’s so different for each of Kennedy’s major programs.

For the Space Shuttle Program, it is the end of the road for those unique vehicles and the decommissioning or transfer and repurposing of the facilities that launched the missions and kept the orbiters flying. For the International Space Station, it’s all about learning to operate in the short term without the shuttle’s significant upmass and downmass capabilities. For the Constellation Program, it’s about leaving low Earth orbit behind and realizing the Vision for Space Exploration.

So with all three programs vying for facilities, funding and people, one would expect a fairly high level of divisiveness in and around the center, not to mention competition. But when you talk to the transition managers for all three programs at Kennedy, you find quite the opposite is true.

Instead, shuttle people are not only working extremely hard to make sure the program’s final missions are executed with the utmost attention to safety, but they’re also working to make sure they’re not excessing equipment and facilities that Constellation could use. Station people are working to retain and protect the skill sets they need, with shuttle and Constellation’s cooperation, for the remainder of the shuttles’ missions and into the post-shuttle period. And Constellation people are working hand-in-hand with both programs to effect the orderly transfer of assets and resources without hampering program operations.

Sounds simple enough when summarized as above, but Johnny Nguyen, Melodie Jackson and John Jackson know otherwise.

Closing a program, excessing history

Johnny Nguyen, former shuttle processing transition manager, has been deep in transition activities since 2005. He remembers that, five years out from the announced end of the program, it was a tall order to get people to focus on the future, post-shuttle.

“It was quite an undertaking to start shifting people’s perspectives and mindsets,” he remembered.

But clear communications and a well-organized shuttle processing transition office made the difference. During quarterly project management reviews, the shuttle processing transition team concentrated on all the shuttle’s transition activities to accurately status where they were, how things were going, was everything in place and were there any issues or challenges that needed to be addressed.

“It became a kind of community event,” Nguyen recalled. “If you wanted to hear about transition, you could come out, listen, get up to speed on what’s going on and what needed to happen. That’s when people started realizing, ‘Wow, it really is coming to an end. They’re doing stuff that’s irreversible.’”

That includes more than just the shutdown of spares suppliers or the drawdown of engineering skills. Transition is already affecting facilities and equipment as well — the transfer of Launch Complex 39B over to Constellation, the building of a new mobile launcher for Ares I and planning for the conversion of the Vehicle Assembly Building’s High Bay 3. That’s high visibility stuff, particularly the demolition of shuttle assets and the construction of Constellation infrastructure. Add to that a continual stream of communications from the transition office, including biweekly email updates to the entire shuttle workforce, and transition at Kennedy just can’t be ignored.

The planning behind this is meticulous and exhaustive. There may be only six shuttle missions left to process and launch out of Kennedy, but there’s still so much to do. Nguyen thinks people can see that there’s activity post-shuttle. The evidence is rising before their eyes everyday.



The new mobile launcher for the Ares rocket is under construction in the mobile launcher parking area at Kennedy.

Holding on to station’s skills

John Jackson, transition manager for the International Space Station, admits that the retention of critical skills in the station’s contractor base post-shuttle is a major transition challenge.

“We have a certain skill mix that we need for shuttle missions to station and a subset of that skill mix for post-shuttle missions, so we want to make sure that we keep the bigger skill mix intact as long as we can,” he explained.

Looking ahead to the station world post-shuttle, John Jackson lists three important activities that will remain at Kennedy.

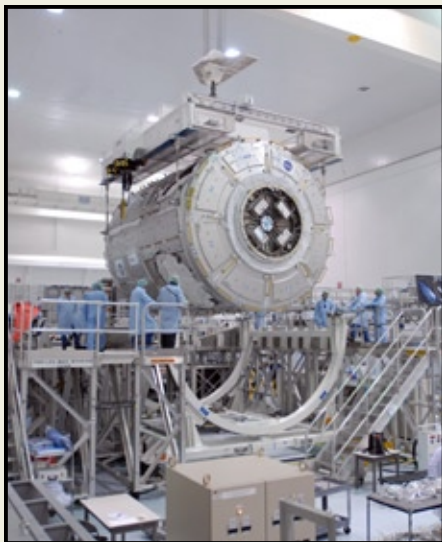
“We’re going to be storing most of the flight hardware that will be used post-shuttle,” he said. “We’re going to be processing the internal and external orbital replacement units (ORU) – or spare parts – here.”

Those ORUs would then be shipped to the launch sites: Kennedy for Orion missions, Japan for H-II Transfer Vehicle missions, Europe for Automated Transfer Vehicle missions and Russia for Progress missions.

“And the third thing we’ll continue to do here is process experiments and test them before shipping them, like the ORUs, to the launch sites,” John Jackson said.

It’s a lot less work for the folks at Kennedy’s Space Station Processing Facility because they won’t be processing the multi-purpose logistics modules or the big external payloads. Post-shuttle, both the payload and ORU traffic models are much lower. Less upmass and no downmass to be processed, means less skills and expertise needed.

According to John Jackson, that situation is prompting more questions than they have answers to. If Constellation moves to the right, station ORUs planned for Orion will have to be shipped to other launch sites, including Cape Canaveral Air Force Station for SpaceX [one of the contractors on the Commercial Resupply Services contract for the space station]. And if shuttle moves to the right, station processing for shuttle missions will continue along with planned processing for non-shuttle supply flights to the ISS. The variables can seem overwhelming at times.



In the Space Station Processing Facility at NASA’s Kennedy Space Center in Florida, an overhead crane lowers the Tranquility module, or Node 3, toward a work stand.



A matter of requirements and cooperation

For Melodie Jackson, Constellation transition manager for ground operations, transition is all about requirements and cooperation. She makes sure that they have the requirements for equipment or facilities that are earmarked for transition to Constellation, and then works out the details of the transfer with the shuttle or station and the center transition office. It sounds simple enough, but it's really not. There are multiple stakeholders and multiple steps to the process of program-to-program transfer of assets, be they people, equipment or facilities.

First, there are requirements to be developed. For Constellation, many of the requirements are in a state of flux as designs evolve and conceptual directions shift. The potential impact of the final report of the Review of U.S. Human Space Flight Plans Committee, led by Norm Augustine is an obvious and timely example.

Next, they have to assess what facilities and equipment are actually out there and if they are, in fact, available for use. If usable, what will it take to transition them over from shuttle or station to Constellation? Will more or fewer people be needed, and what will be the required skills? Will contractors need to be involved for future planning? All this has to be resolved and agreed upon between the programs and the center.

For Constellation, many of the requirements are in a state of flux as designs evolve and conceptual directions shift.

So far, this process has been worked for several highly visible assets, one of which is actually a historical landmark, Kennedy's Launch Complex 39B.

In regards to the future, Melodie Jackson has to wait, like the others, to see which of the Augustine committee's proposals is embraced by the nation's leadership.

"If shuttle isn't extended too far, then it will close up the gap a bit," Melodie Jackson posited. "But if it pushes it out too far, then we'll have to reassess and see what that does to our facility needs, reevaluate our need dates and see what dates shuttle could actually release them to us."

She's not overly worried, though. She feels that they really haven't encountered many issues that couldn't be resolved with equanimity and in a timely manner.

"I think we're working together as a center really well," Melodie Jackson concluded. "We're communicating our needs, and we're always communicating with each other. It's not the least bit contentious. We're working together to make sure that all three programs work out."

The tools and emotions of change

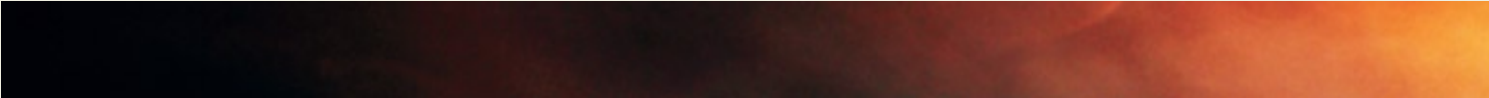
Juan Calero, lead management analyst, is also dealing with the impact of change at Kennedy. But from his seat in human resources, the most important issue on the table is workforce transition. In fact, it requires his undivided attention. Listen to Calero talk about what he and his human resource counterparts are doing on not just a center level, but also agency-wide, and it becomes clear that there are two interwoven sides to the issue. The first is tactical. The second is emotional.

Tactically, the agency embarked on an extensive mapping exercise to determine which skills would "map" to Constellation. Calero and his team at Kennedy were responsible for developing many of the tools that are currently being used at Headquarters and other NASA centers.

... the real key to transition ... is communication.

But the real key to transition, according to Calero, is communication. He attributes the lack of any real morale issues to the center's effort to keep the community as fully informed as possible and the fact that people believe there will be life after shuttle for them. He also made the point that a lot of people are already contributing as much as 10 to 50 percent of their time to Constellation during lulls between shuttle missions. Furthermore, the Constellation need can only increase. With one foot in Constellation's door and one foot in shuttle's, transition doesn't necessarily feel all that scary.

So Calero and his team keep their collective eye on the workforce and take care of the tactical issues that arise as best they can. They evaluate where skills may be a mismatch from program to program and talk to their training partners about where a part of the workforce may require



retraining in order to be of value elsewhere. They have looked long and hard at Constellation's requirements to determine where there will be gaps for certain skills.

Emotional investment

The emotional side of the transition issue is not as easily quantified or predicted. Calero worries about the toll taken when engineering and work teams are broken up, some individuals reassigned and some out of work. Civil servants and contractors have been equally committed to the shuttle program. But in the transition from shuttle to Constellation, the biggest workforce outages will be experienced in the contractor world.

**... the workforce – and Kennedy certainly hasn't
cornered the market on this – genuinely care
about the shuttle, its achievements and its legacy.**

"It's already started with the announcement of layoffs with United Space Alliance," Calero related. "And we'll see more of it in the future, and it'll be a challenge handling the emotional part of losing your teammate."

Another facet to the emotional cost of transition is that the workforce – and Kennedy certainly hasn't cornered the market on this – genuinely cares about the shuttle, its achievements and its legacy. They are tied to the vehicle and the program just as viscerally as an artist is tied to his or her masterpiece. To many, it's their life's work. They aren't ready to leave it unfinished.

In the face of uncertainty, mitigate risk

So with the lunar work slipping to the right and the jury still out on the Augustine commission's report, it's pretty tough to say with any degree of certainty what's in store for Kennedy. But that hasn't stopped center leadership from trying to mitigate the risk inherent in a major change in employment. Wetmore explained that they used Kennedy's center risk system to develop a three-pronged mitigation plan.

"First of all, we wanted to make sure we were fighting for whatever NASA roles and as much NASA work for our center as we can get to make sure that we have a robust future," he said. "Second, we started actively looking for non-traditional KSC and non-NASA work that could be brought to our center."

The third prong of the plan is communications. It's vitally important that the broader community outside the gates, as well as the political community of the state, understand the current and coming situations. [Editor's Note: See "Outside the Gates" in this issue of Rendezvous.]

Wetmore believes, however, that this is a great opportunity for the community to get on board and bring other aerospace or non-aerospace work into the area to take advantage of the existing workforce. In short, smart business tactics.

The future's on the line

Although it represents opportunity for many inside and outside Kennedy's gates, it's also a complex phase in the history of human spaceflight, and it needs to be negotiated with great care and attention to detail. There is an awful lot on the line, after all, such as the legacy and future of the nation's space program.

"There's a tremendous rate of change going on both inside our gates and outside," Wetmore explained. "So we have to be concerned that transition doesn't become the distraction."

He emphasized that if the workforce is concerned, they need to raise that issue and let people know, so that leadership can take the appropriate steps.

"If we need to stop, to call a timeout, we will," he said. "But our number one priority remains the safety of the flight crew, safe processing of the shuttle and completion of the mission. Because if we don't fly out shuttle, there isn't going to be a Constellation."

The devil's in the details

Nguyen maintained multi-page spreadsheet schedules for transition planning, flight asset disposition and generic orbiter safing; and listings for Kennedy ground operations maintenance and engineering users (more than 8,200 items), Kennedy ground operations property (more than 17,300 items) and Kennedy facilities (more than 200, including the alternate landing sites in France, Spain, California and New Mexico) including program-to-program and contract-to-contract status and the last need date for every line item. This level of detail is not reserved for the transfer of assets to Constellation or their disposition. Nguyen's schedules also cover shuttle-station assets that will either transition over or no longer be needed post-shuttle, including major flight assets (such as the multi-purpose logistics modules), assigned flight assets, unassigned flight assets and post-shuttle T&R operations maintenance and engineering users.

Visible changes


In addition to the new lightning suppression system that has already been added to Pad 39B, the fixed and rotating service structures will be removed. Melodie Jackson explained that the new mobile launcher platform under construction for Ares I was designed with a tower on it to replace the service structures on the pad. The Ares I rocket is considerably taller than the shuttle stack at the pad and requires a different configuration to stabilize and service it. All the umbilicals connected to the Ares I will be on the mobile launcher tower instead of the pad, so it's more of a "clean pad" operation.

Constellation is also getting ready to start on the transition and subsequent modification of the Vehicle Assembly Building's high bay 3. According to Melodie Jackson and Charlie Gambaro, senior project manager for Constellation, this project still has a lot of questions associated with it. Scheduled for an early January 2010 turnover, high bay 3's future is literally in limbo until the Augustine committee submits its final report and decisions are made. Gambaro is waiting to find out when, or if, he can start demolition on the high bay's work platforms.

Two other facilities that have already transitioned over to Constellation are the Launch Control Center's Firing Room 1 and the back of the Operations and Checkout building, which has been transferred to the Orion project office. The latter facility has already been modified to accommodate the buildup of the service module and crew module before the vehicles are turned over to ground operations. In effect, the building has been turned from a shuttle horizontal payload processing facility into a Constellation production facility.



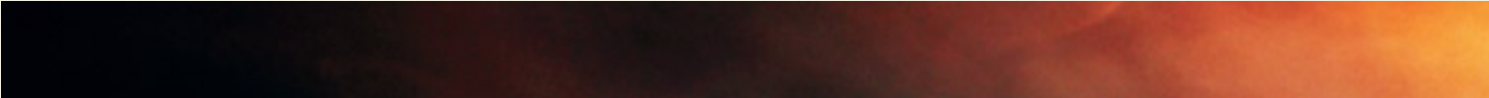
The Vehicle Assembly Building at KSC with the Launch Control Center visible on the left.

A satellite image of a coastal region, likely the Gulf of Mexico, showing land, water, and clouds. A gradient bar at the top transitions from black to orange, suggesting a sunset or sunrise. Overlaid on the image is the text 'How does T&R affect the communities around our centers, and what's being done about it?' in a white, italicized font.

How does T&R affect the communities around our centers, and what's being done about it?

Outside the Gates

In our last issue of *Rendezvous*, we talked to both agency and contractor transition managers and human resource representatives about the workforce transition initiatives being put into place to address the impending changes in our space program landscape. For this issue, we moved “outside the gates” to find out how our surrounding communities are dealing, or planning to deal, with the issues inherent in shuttle retirement, the onset of a new program and the gap between the two. Communities around NASA centers and facilities across the country are facing transition-related changes and finding a variety of ways to plan for them.



The leading question both inside and outside the gates of NASA's space centers is "What will be the end result of transition?" It's a question with no easy or convenient answer.

The fact is, the details of transition are fluid. And the agency and its many contractors, its workforce and the communities where they work and live and play are working to make the transition as smooth as possible.

Many state and municipal economic agencies, chambers of commerce and other employment organizations across the nation have been focusing on shuttle retirement and transition for the past couple of years. In addition to the community groups that are working to help out employees affected by transition, a Shuttle Transition Liaison Office has been established at NASA Headquarters to help the community groups themselves – and not just in areas near NASA centers. The office is virtual, in that it works with communities across the country affected by transition. The office is led by Sherri McGee, director of the workforce management and development division of the Office of Human Capital Management. McGee serves as a point of contact to those outside the center gates and helps them keep track of assistance that other agencies offer at the federal, state and local levels.

... a Shuttle Transition Liaison Office has been established at NASA Headquarters to help the community groups ...

It's all about the timing in Texas

In Houston, for several years the Texas Workforce Commission (TWC) and the Bay Area Houston Economic Partnership, known as BAHEP, have been working in concert with human resources at Johnson Space Center and the area's academic institutions to support the needs of the country's space program. Initially, TWC, BAHEP and a consortium of entities banded together to create the Aerospace and Biotechnology Academy at San Jacinto College to ensure that there would be a source of aerospace engineers for the Johnson Space Center, its contractors and its myriad programs. Over the past half dozen years, they've been able to raise about \$12 million to make training and cross-training opportunities available to space program workers throughout the area. Most recently, an Aerospace Workforce Innovation Network (AWIN) grant valued at approximately \$1.47 million identified 13 different aerospace workforce needs or deliverables. Of those needs, more than half had to do with the transition between the space shuttle and Constellation Programs, the outplacement of workers and their skills, and training and retraining of the workforce.

According to Bob Mitchell, president of BAHEP, a significant concern to the contractor population in and around Johnson was the possible impact of a premature announcement of any workforce reductions. So Mitchell took another tack.

"If you can't tell me the numbers, maybe you can tell me what skill mixes will be caught up in the first, second and third rounds of reductions," Mitchell asked various NASA contractors. Armed with that information, he could go to the Texas Workforce Commission and ask for their help in cross-referencing those soon-to-be available skill sets with needs in other area industries. He could also identify where training would be necessary and what kind.

Working with Allison Hennessey of the Aerospace and Biotechnology Academy at San Jacinto College, Mitchell and the other members of BAHEP pulled together a strategy to mitigate the workforce impact of transition on the area surrounding Johnson. They started with "train the trainer" sessions in January, in which they trained contractor employees in the management of organizational transition, and followed in early April with a transition assistance program focused on transitioning employees. The latter program included representatives from Texas A&M University, The University of Texas at Austin, San Jacinto College and The University of Houston, who gathered to discuss ongoing educational opportunities for transitioning workers.

The Aerospace and Biotechnology Academy also received a Texas Workforce Commission Skills Development Fund grant worth \$722,000 to meet the training needs of the aerospace industry in the Houston Bay Area. The primary goal of this



one-year project was to “develop effective, employer-driven training opportunities that will provide a skilled workforce pipeline to meet the short- or long-term needs.”

Translated to NASA parlance, short-term needs would cover flying out the shuttle program safely, and the long-term needs would include cultivating the skills necessary to design, develop, test, evaluate and fly the Constellation vehicles. The employer-driven training opportunities would be offered to incumbent workers, new hires and potential new hires that desired to upgrade their skills and certifications. In the Johnson Space Center community, 21 employers are currently participating in the program.



ET-120 is shown in the modification center at the Michoud Assembly Facility.

Excited by opportunity, but concerned about change in the South

Further east on the Gulf Coast, workforce transition is spurring activities in and around Michoud Assembly Facility just outside New Orleans and in the area near Bay St. Louis, Mississippi where Stennis Space Center is located. Hit hard by Hurricane Katrina four years ago, much of the area is still recovering.

But, according to Bryan Moore, director of the New Orleans Workforce Investment Board, and Melissa Kirsch, director of Louisiana Works, the hurricane recovery effort has actually helped:

As Moore explained, prior to the hurricane, the region was already suffering from a sustained flat jobs growth rate, and in fact had experienced jobs shrinkage. Many hurricane evacuees haven't returned to the area due to the severe housing shortage. And, the recovery effort brought a significant number of reconstruction projects into the area that accounted for a kind of spike in jobs growth. The problem is, those kinds of jobs aren't necessarily the right ones for a highly skilled, highly trained workforce that has been

building external tanks for the shuttle program for the last three decades. That presents a challenge.

Another factor to consider is that a large percentage of the workforce has decades of experience on the job. They haven't prepared résumés, filled out job applications or interviewed for positions in more than 20 years. So this is where Moore and Kirsch are focusing their efforts and resources.

“We have to expose them to the available alternatives that can utilize their existing skill sets and help them transfer those skills and capabilities over to a new profession,” Moore explained.

The Business & Career Solutions Center, a transition center established in the fall of 2008 by Louisiana Works, is located in a building across the street from the Michoud Assembly Facility and Lockheed Martin's on-site offices. According to Kirsch, they wanted to make it as easy and convenient as possible for transitioning employees to drop in on their lunch hours, or before or after work, to talk to staff, seek assistance with job searches, résumé writing and even look into training opportunities appropriate to their skills, capabilities and interests.

“We set it up so that we could encourage employees to come over and start using our resources as soon as they received their ‘last need’ notices,” explained Kirsch. “We conduct orientation sessions to find out if they're interested in getting additional training to help them qualify for another type of job.”

**"We set it up so that we could encourage employees
to come over and start using our resources ... "**

Louisiana Works facilitates bringing people and jobs together through a quarterly recruiting event – a kind of jobs fair in which regional employers who are hiring share their future needs with Lockheed Martin employees – and sends business service representatives out into the communities with listings of employees' occupational skills to search for potential employment matches. In addition, there's LaWorks.net, where Lockheed Martin's Michoud workforce can log on to conduct job searches by industry and occupation. The site provides them with listings of eligible training providers, as well as state-approved and funded training opportunities.

Staying in business at Stennis

A little less than 60 miles to the east along Interstate 10, Stennis Space Center is facing changes and challenges of a slightly different nature. Because Stennis is a NASA shared services site with a U.S. Navy presence, the center's base of activities is diverse. This means that as the testing winds down on the space shuttle main engine, not only will other testing ramp up on the engines needed for Constellation, but in the interim, the center will have ongoing work from the Navy and Rolls Royce.

So, at Stennis the emphasis is not so much on providing workforce transitioning services as it is on bringing more diverse work into the center to help provide employment through the gap. This is what Partners for Stennis, a volunteer, non-profit organization of private citizens, small business owners, teachers, space and non-space business representatives, works on. They strive to promote awareness of the benefits of human space exploration and support NASA through focused communications with their elected officials in Washington.



A night time test firing at one of the test stands at Stennis Space Center.

**... as the testing winds down on the space
shuttle main engine ... other testing will ramp up
on the engines needed for Constellation ...**

The changing landscape at the Cape

Move another 650 miles or so east to the Atlantic Coast of Florida, and there's yet another set of workforce transition initiatives in play. Two regional organizations, the Brevard Workforce Development Board and the Economic Development Commission of the Space Coast, are hard at work preparing for the retirement of the space shuttle and subsequent gap before Constellation is up to full speed. And both organizations have been granted Space Act Agreements with Kennedy Space Center for the purpose of preparing both its workforce and the community-at-large for those same transition issues facing the other centers.

However, the landscape at Kennedy is not quite the same as it is at Johnson Space Center or Michoud Assembly Facility or Stennis Space Center. According to the current plan, International Space Station payload processing and launch operations will remain at Kennedy; and certain fabrication and assembly operations, previously done elsewhere, would be added to the center's capabilities. However, the Vision for Space Exploration calls for a much leaner workforce for all Constellation ground processing and flight operations.

Judy Blanchard, director of industry relations for the Brevard Workforce Development Board, got her people moving more than two years ago. She explained that the overall Kennedy workforce, which includes both civil servants and contractors, is the highest paid workforce in the county, so the Board knew they had to do something to address the coming transition. There are approximately 9,600 aerospace workers in the Kennedy workforce, which represents almost 25% of Brevard County's aerospace and high technology employment base.

"They say that about a third of these workers will cross to the new program," Blanchard explained. "Another third will likely retire, and then you'll have the final third that will be dislocated."

This means that Brevard County could have more than 3,000 highly skilled workers available for other work.

**... Brevard County could have more than 3,000
highly skilled workers available for other work.**

So the board commissioned an outlook study to get a more accurate picture of how many workers were affected, what kinds of jobs they were doing and what kind of skills they'd walk away with. Once they had that data in hand, they proceeded to assemble the stakeholders.



"We wanted to get the support of everybody on the Cape," Blanchard explained. "Get everyone on the same sheet of music, and make sure that our state aerospace legislative agenda was in sync, too, especially if we had any hope of receiving funding to address the issue."

That effort led to the formation of the Aerospace Career Development Council, a group of stakeholders that includes United Space Alliance, Lockheed Martin Corp., Boeing Co., Harris Corp., Alliant Techsystems (also known as ATK), United Launch Alliance, the EG&G Division of the URS Corp. and other contractors, as well as NASA, the county commission representation, the U.S. Air Force, economic development and academic partners, as well as the local state delegation.

The council's first task was to secure the funding necessary to address the transition needs of as many as 4,000 people. So they went to the state of Florida to request funds to start the Aerospace Workforce Transition (AWT) program. Since then, the council has received additional grants from the U.S. Department of Labor, the Economic Development Administration and from Workforce Florida.

A comprehensive program

The AWT program covers communications and outreach, workforce skills assessment, workforce support services, training and retraining.

"We needed to get out and say, 'Hey, we're here,'" Blanchard explained. "Because we knew that there was a lot of uncertainty in the workplace." A major part of the workforce was afflicted with that "deer in the headlights" syndrome, she said.

"They're just frozen," Blanchard said. "It's like they're saying; This is all I've ever known, so if I just stand still, maybe I'll get caught up in the movement and I'll get carried along [to the next program] and I'll be fine."

But Blanchard and the Board know this won't work, so they've implemented an extensive communications and outreach program to get the right information about opportunities out there. There's a Web site, an online and hard copy newsletter distributed monthly, brochures, flyers, posters, even billboards, broadcast commercials and the Mobile Express parked several times per week on-site at Kennedy Space Center. The latter is a rolling career counseling office where workers can go to get help with their résumés and interviewing skills, and determine if and where they might benefit from additional training, among other career transitioning services. Just last year, the board received permission from the center to open an office in the headquarters building so that the workforce board's AWT program services could be accessed five days per week, eight hours per day.

... they've implemented an extensive communications and outreach program to get the right information about opportunities out there.

In addition to this onsite center presence, the workforce board is also focusing outreach efforts on neighborhoods and the businesses of Brevard and its surrounding counties. To the region's industry, the message is, 'You're going to have a lot of highly skilled, highly trained workers available in this area who have a terrific work ethic, as well as a great safety and reliability culture built into them — and we're working to identify all those skill sets and map them to your needs.'

"We ask them to tell us what they need, where they see the work packages coming in and what type of skills they will require in the future," explained Blanchard. "Because we could be training these folks right now."



Overcoming the “never-before” factor

Where Blanchard and the team at the Brevard Work Development Board focus on the workforce, Lynda Weatherman, president of the Economic Development Commission (EDC) of the Space Coast, and her team focus on the work.

“Our strategy was to identify the Constellation ‘work packages’ that could come to Kennedy to try to mitigate the impact of the gap,” Weatherman explained. “Our first focus was on capturing the final assembly and checkout of the crew exploration vehicle [Orion].”

They worked with both of the contractors who were competing for the contract to demonstrate the competitive advantage of doing business at Kennedy. The challenge was overcoming the “never before” factor, because, in the 50+ year history of launch and space program activity at the Cape, vehicle assembly and checkout had always been done elsewhere.

The challenge was overcoming the "never before" factor ...

Weatherman attributes their success in this endeavor to three things: 1) They identified the opportunity early; 2) They worked directly with both contractors to bring the proposed work to Kennedy; 3) The state of Florida came to the table with approximately \$3 million. In the end, the Orion assembly and checkout work will account for as many as 400 jobs at Kennedy. Based on that early success, the EDC team is now looking at other NASA workforce projects, Constellation and otherwise, as well as at working with the Space Coast's resident industries to bring more business into the area.

“What’s good about our area and matching the oversupply of labor [as a result of the gap] to demand is that we have a significant amount of captive technical and defense aerospace manufacturing on the Space Coast,” Weatherman elaborated.

Manufacturing represents approximately an 8 percent share of the state’s industry. However, on the Space Coast, manufacturing accounts for between 14 and 15 percent of the pie. So in Weatherman’s mind, there’s a better chance that more of those highly skilled, highly trained workers will not need to leave home and uproot their families to find work.

A set of shared goals

The types of initiatives implemented by these state, municipal and public entities differ from region to region, center to center and culture to culture. But they all share several important common elements, too. They all want to help any way they can. They’re all providing as many support services as deemed necessary to help prepare the workforce for what’s around the corner. They all have a vested interest in trying to keep their NASA workforce and long-time residents employed within their regions.

And they’re all trying to make this transition go as smoothly as possible.

Outside Help

Around Johnson Space Center

- Texas Workforce Commission (<http://www.twc.state.tx.us>)
- Bay Area Houston Economic Partners (BAHEP) (<http://www.bayareahouston.com>)
- Aerospace Academy (<http://www.aerospace-academy.org>)

Around Kennedy Space Center

- Brevard Workforce Development Board (<http://www.bwdb.org>)
- Economic Development Commission of the Florida Space Coast (<http://www.spacecoastedc.org>)

Around Michoud Assembly Facility

- Louisiana Workforce Commission (<http://www.laworks.net>)
- New Orleans Workforce Investment Board (<http://www.cityofno.com>)

Around Stennis Space Center

- Partners for Stennis (<http://www.partnersforstennis.org>)

T&R

Progress Report Activities Across NASA



"Space operations are among the most complex and unforgiving pursuits ever undertaken by humans. It really *is* rocket science. Space operations become all the more difficult when means do not match aspirations. Such is the case today."

—*Review of U.S. Space Flight Plans Committee Summary Report*

Pictured above: The Ares 1-X stack is surrounded by work platforms in the Vehicle Assembly Building at KSC.

The Vision in Review

NASA Leadership Reports for Duty

Marking the End of an Era

Two More Minutes of Smoke 'n Fire

Constellation Rising

Orion Launches to Station, Virtually

Docks Completed, Another Stennis Milestone Marked

Scouting Out the Moon

It Weighs a Ton, but It Floats

The Vision in Review

On May 7, the Obama administration announced the launch of an independent review of planned U.S. human spaceflight activities with the goal of ensuring the nation is on a vigorous and sustainable path to achieving its boldest aspirations in space.



Norman Augustine

The Review of U.S. Space Flight Plans Committee is headed by Norman Augustine, the retired chairman and CEO of Lockheed Martin Corp., and former member of the President's Council of Advisors on Science and Technology under Presidents Bill Clinton and George W. Bush. Augustine is also known for leading another similar review panel in 1990. This panel was faced with an agency dealing with limited funding, an aging workforce and increasing complexity and costly programs.

Working with Augustine is a noteworthy group of space program veterans and experts (listed at the end of this item). For the review process, the committee was divided into subcommittees with four different areas of focus: International Space Station and shuttle, exploration beyond low Earth orbit (LEO), integration and LEO access.

The space station and shuttle subcommittee, led by Ride, had the task of exploring options regarding science, the industrial skill base, the human spaceflight gap, shuttle safety and schedule, station extension, station utility and cost.

The exploration beyond LEO subcommittee, led by Crawley, focused on elements of the next generation of exploration, such as science, industrial skill base, unknowns (radiation, etc.), long duration operations, destinations and architecture options in regard to cost, schedule, etc.

The integration subcommittee, led by Lyles, studied international, interagency and industrial skill base options, as well as overall budgetary issues.

The final group, the LEO access subcommittee, led by Bejmuk, explored options for LEO operations, focusing on commercial options, the industrial skill base, the status of the Constellation Program and other alternatives.

In addition to the subcommittees' activities, the review panel sought input from the public through several channels. Over the summer, the committee held a series of public meetings in Houston; Huntsville, Ala.; Cocoa Beach, Fla.; and Washington. Additionally, input was submitted online and through mail by concerned citizens, and taped or written messages from several state and national representatives.

The committee is compiling a final report detailing options to human spaceflight. The committee released a summary report on Sept. 8. The summary outlined the tasks given the committee and describes five options for moving forward in human spaceflight and the considerations that shaped them.

The findings of the committee were derived from asking five principle questions:

1. What should be the future of the Space Shuttle?
2. What should be the future of the International Space Station (ISS)?
3. On what should the next heavy-lift launch vehicle be based?
4. How should crews be carried to low Earth orbit?
5. What is the most practicable strategy for exploration beyond low Earth orbit?

From these five driving questions, the committee formulated five options for the future of human spaceflight.



Dr. Sally Ride



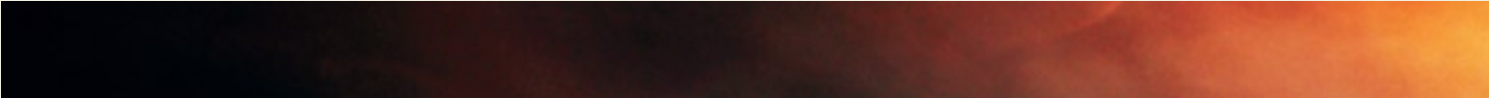
Lester Lyles



Dr. Edward Crawley



Bohdan "Bo" Bejmuk



Option 1: Program of Record, constrained to the FY 2010 budget

This option calls for human spaceflight programs to continue as is with only slight modifications providing funds to the Space Shuttle Program, extending it into 2011, and to the International Space Station to accommodate de-orbiting in 2016. However, this option would likely result in significant delays for the Constellation Program.

Option 2: International Space Station and Lunar Exploration, constrained to the FY 2010 budget

This option will extend station to 2020, and would begin lunar exploration with Ares V (Lite). However, this option halts heavy-lift capability until 2020 and does not provide the funds needed to land on or explore the moon.

Option 3: Baseline Case – Implementable Program of Record

This plan is an executable version of the program of record, extending the shuttle program to 2011 and de-orbiting station in 2016. It also includes developing Ares I, Ares V and Orion as well as beginning exploration of the moon.

Option 4: Moon First

This option maintains the moon as the first destination for human spaceflight beyond LEO, and it has two variations. The first variation would end the shuttle program in 2011 and developing Ares V, and the second would extend shuttle to 2015, while developing a more shuttle-derived heavy-lift vehicle.

Option 5: Flexible Path

The final option calls for the operation of the shuttle into fiscal year 2011, extension of the ISS until 2020, and funding of technology development of commercial crew services to LEO. It also offers three variations for heavy-lift capabilities, including Ares V, a commercial heavy-lift option and shuttle-derived heavy-lift vehicle.

On September 15 and 16, Augustine testified in front of the House Committee on Science and Technology and the Senate Committee on Commerce, Science and Transportation. Augustine presented information from the still-pending report and fielded questions from the two groups of policy makers. The focus of both days centered on the financial hurdles intrinsic to a robust human spaceflight program.

For more information about the U.S. Human Space Flight Plans Committee, visit <http://www.nasa.gov/offices/hsf/home/index.html>. To read the summary report, visit http://www.nasa.gov/pdf/384767main_SUMMARY%20REPORT%20-%20FINAL.pdf. For written testimonies and transcripts from the hearings, visit http://www.nasa.gov/offices/hsf/meetings/09_15_hearing.html and http://www.nasa.gov/offices/hsf/meetings/09_16_hearing.html. Also, watch for ongoing coverage of the findings and results of the Review of U.S. Human Space Flight Plans Committee in the coming months at <http://rendezvous.jsc.nasa.gov>.

The Augustine committee

- Dr. Wanda Austin, president and CEO, The Aerospace Corp.;
- Bohdan “Bo” Bejmuk, chair, Constellation Program Standing Review Board, and former manager of the Boeing Space Shuttle and Sea Launch programs;
- Dr. Leroy Chiao, former astronaut, former International Space Station commander and engineering consultant;
- Dr. Christopher Chyba, professor of Astrophysical Sciences and International Affairs, Princeton University, and member, President's Council of Advisors on Science and Technology;
- Dr. Edward Crawley, Ford Professor of Engineering at Massachusetts Institute of Technology and co-chair, NASA Exploration Technology Development Program Review Committee;
- Jeffrey Greason, co-founder and CEO, XCOR Aerospace, and vice-chair, Personal Spaceflight Federation;
- Dr. Charles Kennel, chair, National Academies Space Studies Board, and director and professor emeritus, Scripps Institution of Oceanography, University of California, San Diego;
- Retired Air Force Gen. Lester Lyles, chair, National Academies Committee on the Rationale and Goals of the U.S. Civil Space Program, former Air Force vice chief of staff and former commander of the Air Force Materiel Command; and
- Dr. Sally Ride, former astronaut, first American woman in space, CEO of Sally Ride Science and professor emeritus at the University of California, San Diego.



Charlie Bolden, 12th administrator of NASA.

NASA Leadership Reports for Duty

Transition is happening on more than just a program level as NASA gets a new administrator and deputy administrator.

Charlie Bolden, former astronaut and retired United States Marine Corps major general, is the twelfth administrator of National Aeronautics and Space Administration after being nominated by President Barack Obama on May 23, 2009 and confirmed by the Senate on July 16, along with new deputy administrator Lori Garver.

"Today, we have to choose," said Bolden during his and Garver's confirmation. "Either we can invest in building on our hard-earned world technological leadership or we can abandon this commitment, ceding it to other nations who are working diligently to push the frontiers of space."

This isn't Bolden's first time being on the NASA team. In 1980, he began his career with the agency, joining NASA's Astronaut Office and flying to orbit four times, twice as mission commander. During his astronaut career, Bolden also served as the astronaut office safety officer; technical assistant to the director of Flight Crew Operations; special assistant to the director of the Johnson Space Center; chief of the safety division at Johnson (overseeing safety efforts for the return to flight after the 1986 Challenger accident), lead astronaut for vehicle test and checkout at the Kennedy Space Center and assistant deputy administrator at NASA Headquarters. He was inducted

into the U.S. Astronaut Hall of Fame in May 2006.

With this recent appointment, Bolden finds himself at a unique point in history, balancing the goals of the previous administration while focusing on the vision for the future.

"If we choose to lead," Bolden said, "we must build on our investment in the International Space Station, accelerate development of our next generation launch systems to enable expansion of human exploration, enhance NASA's capability to study Earth's environment, lead space science to new achievements, continue cutting-edge aeronautics research, support the innovation of American entrepreneurs and inspire a rising generation of boys and girls to seek careers in science, technology, engineering and math."

Aiding Bolden in this endeavor is Lori Garver, who was confirmed as the agency's deputy director. Garver draws on her wealth of experience as the former president of Capital Space, and has served as senior advisor for space at the Avascent Group, a strategy and management consulting firm based in Washington. She was the lead civil space policy advisor for Obama for America, and she helped lead the Agency Review Team for NASA during the transition between the presidential administrations.

Like Bolden, this is not Garver's first stint with NASA. From 1998 to 2001, Garver served as NASA's associate administrator of the office of policy and plans. Reporting to the NASA administrator, she oversaw the analysis, development, and integration of NASA policies and long-range plans, the NASA Strategic Management System and the NASA Advisory Council.

"I am very excited about the opportunity to serve under Charlie Bolden's leadership," Garver said during confirmation. "My previous five years at NASA exposed me to the incredible talent of the workforce there. The unbelievable achievements of this team over its 50-year history are unmatched. I look forward to working with Charlie and the NASA team to make our agency work as effectively as it can for the American people."

As deputy administrator, Garver serves as the agency's liaison to the Executive Office of the President, Congress, heads of government agencies, international organizations, and external organizations and communities. Additionally, she oversees NASA's Office of the Chief Financial Officer, Office of General Counsel and Office of Strategic Communications.

Bolden and Garver have visited NASA's Langley Research Center, Kennedy Space Center, Marshall Space Flight Center, Johnson Space Center, Ames Research Center and Michoud Assembly Facility and are committed to visiting all NASA centers.

More information on Bolden and Garver can be found at http://www.nasa.gov/about/highlights/bolden_bio.html and http://www.nasa.gov/about/highlights/garver_bio.html respectively.



Lori Garver, NASA deputy director.



Then and now — the first test of a space shuttle main engine on Stennis' A-2 test stand and the last.

Marking the End of an Era

It only took a little more than 8 minutes to mark the end of an era at Stennis. For 520 seconds, the last space shuttle main engine test went through its familiar paces — deafening roar, vibration, plenty of steam and heat — and then it was over. For good.

On July 29, the last scheduled test of a space shuttle main engine was run on the A-2 Test Stand at Stennis Space Center, bringing a 34-year record of testing to an end. In three-plus fiery decades of tests, more than 50 main engines were certified for use on 130 shuttle missions on the Stennis test stands, many of them on A-2. Overall, more than 2,000 main engine tests, which totaled more than one million seconds of hot-fire time, were conducted for development, certification, acceptance and anomaly resolution — leaving behind a time-honored team of propulsion and testing engineers and many others, to take its place in the history of the U.S. Space Program.

Two More Minutes of Smoke 'n Fire

Although it didn't really blast off, the two-minute test of the Ares I first stage five-segment solid rocket motor conducted at Alliant Techsystems's Promontory, Utah, facility generated plenty of firepower while providing propulsion test engineers with the valuable thrust, roll-control, acoustics and vibration data. This Sept. 10 test marked the first major ground test of the Constellation Program.

Mounted horizontally in a test stand modified from the shuttle era's four-segment configuration, the Ares I first stage bore a striking resemblance to its forbearer. In fact, its propellant and cases were the same as those used for the shuttle's solid rocket boosters.

The cases in this first stage ground test had collectively flown on 48 missions, including the shuttle's very first flight. The primary differences between the Ares I first stage and the shuttle's solid rocket boosters are the addition of a fifth segment for the Ares I, changes to the propellant grain, a larger nozzle opening and upgraded insulation and liner.

Constellation Rising

On May 31, Launch Pad 39B at Kennedy Space Center was officially transferred from the Space Shuttle Program to the Constellation Program. Originally built to accommodate the Saturn V rockets that launched the Apollo capsules to the moon, Launch Pad 39B was modified to support space shuttle operations in July 1975, and was the scene of 53 shuttle launches.

The handover took place after Endeavour (STS-127) was moved to Launch Pad 39A. Modifications to the launch pad to prepare it for use by the Constellation Program will include removal of the orbiter access arm as well as a section of the gaseous oxygen vent arm, the installation of new access platforms and a vehicle stabilization system to steady the 325-foot-tall Ares I-X, scheduled for its debut test in Oct. 2009.

Orion Launches to Station, Virtually

Across multiple NASA centers, rooms were packed with experts and enthusiasts eagerly awaiting the launch of one of NASA's newest spacecraft. Mission controllers, engineers, ground operators and many more workers congregated to witness history. They gathered to watch the Orion spacecraft launch toward the International Space Station — which is quite the technological feat considering the Orion spacecraft is still under development.

There was something different about this launch viewing. Instead of a myriad data-filled screens, the monitors were filled with highly detailed computer graphics, because this launch was simulated. In other words, a "virtual" mission.

This was also history in the making. It was the first virtual mission ever for NASA's Constellation Program and an unqualified success. Conceived by Jeff Hanley, Constellation



An artist's depiction of a virtual mission to the International Space Station.

program manager, and led by Bob Castle, mission manager, the purpose of these virtual missions is to simulate the mission planning processes as well as test and utilize new software with the hopes of reducing mission certification time. The simulation also calculated other important processes such as schedule changes, vehicle performance, cargo distribution and other important data, all of which have a big effect on the outcome of the mission.

The early stages of these virtual missions have already produced a number of lessons learned that are immensely valuable and should facilitate refining mission processes when it comes time for the real thing. They help make sure every contingency is covered to minimize potential problems. Representatives from all over NASA, coast to coast, are participating now in these virtual missions, with the next one scheduled to “launch” in November.

Virtual missions are, in effect, beta tests to real life missions.

Docks Completed, A-3 is A-OK

Not since the 1960's has there been a test structure of this magnitude built at Stennis. The A-3 test stand construction began in August 2007 with the hopes of being ready for activation testing in early 2011. The purpose of the test stand is to provide high-altitude testing of the J-2X engine for Constellation.

A crucial segment of this test structure, which was completed on July 2nd, is the new transfer docks. These newly constructed docks will allow fuel barges to deliver propellants to the A-3 test stand via Stennis' canal system. Now that the docks are complete, they'll be utilized to transport and load liquid hydrogen and liquid oxygen into run tanks for use in engine testing. The new docks are also designed to allow for direct liquid transfer even during a test.

The stand is massive. At 300 feet, the stand differs from its largely concrete counterparts in that it features a structural steel frame and uses chemical steam generators that simulate altitudes of up to 100,000 feet. This is critical because the J-2X engine is required to be able to fire in space to allow humans to go beyond low Earth orbit.

The completion of the transfer docks marked another milestone for the Constellation Program at Stennis.



Stennis' new A-3 test stand rises above the surrounding wetland.



K10 Red moves through its paces at Black Point Lava Flow in Arizona.

Scouting Out the Moon

In mid-June, a couple of hardy little robots known as “K10 Red” and “K10 Black” were put through their paces at Black Point Lava Flow in Arizona. Developed at NASA's Ames Research Center, the two lunar scouts were remotely controlled by scientists at the Lunar Science Institute at Ames to collect data using the robots' cameras and 3-D laser scanners.

During the two-week experiment in June, the K10 robots navigated an area within Black Point Lava Flow chosen for its similarity to the Rupes Recta or “Straight Wall” fault on the moon. The experiment's engineers and scientists will use the findings to plan robotic lunar reconnaissance missions in the future. Robotic scouting missions can help reduce the amount of uncertainty and unnecessary risk a human crew may encounter in lunar extravehicular activities.

It Weighs a Ton, but It Floats

NASA and Alliant Techsystems (also known as ATK) test engineers successfully completed the first test of the Ares I rocket's three main parachutes on May 20 in the

Sonoran Desert in southwestern Arizona. The successful testing of the cluster parachutes signals that we are rapidly approaching a new age in space exploration.

The three parachutes are measured at 150 feet in diameter and weigh an astonishing 2,000 pounds each. Designed to slow the rapid descent of the Ares I rocket's spent first-stage motor, these 1-ton parachutes are the largest rocket parachutes ever produced.

Marshall engineers managed the team that conducted the first cluster test at the U.S. Army's Yuma Proving Ground near Yuma, Arizona. Researchers dropped a 41,500-pound load from a U.S. Air Force aircraft at an altitude of 10,000 feet. The parachutes and all corresponding hardware functioned properly and the load landed safely.

This test was the eighth in an ongoing series of tests supporting the development of the Ares I parachute recovery system. As the testing series progresses, industry engineers will perform three classifications of testing — development, design load, and overload — to fully test the performance of the new parachute designs with different size payloads under various conditions.

The recovery system under development uses parachutes comparable to the ones used for the four-segment space shuttle boosters. However, the Ares I will have a five-segment rocket booster instead of four and will fly faster as well as fall from a higher altitude than the shuttle boosters.

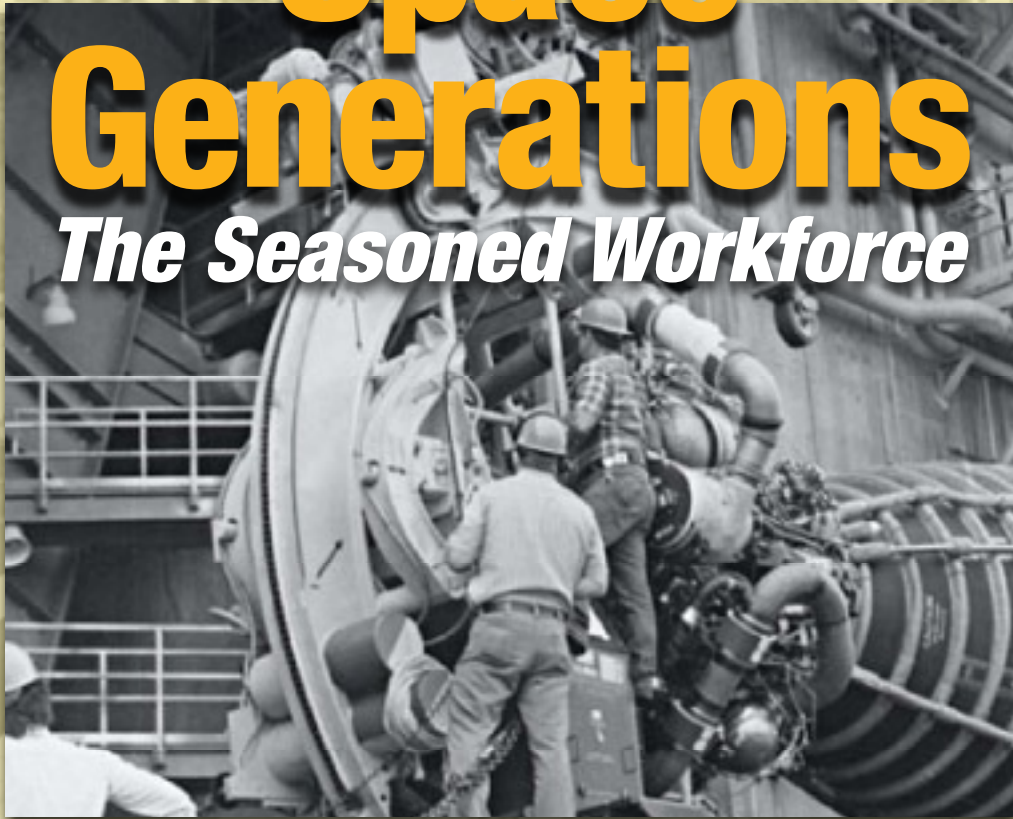
ATK Space Systems is the prime contractor for the first stage booster. United Space Alliance, subcontractor, is responsible for the design, development and testing of the parachutes. The next test in the cycle will be conducted this fall, and will involve the first design limit load test of a single main parachute.



The three parachutes are designed to slow the rapid descent of the Ares I first stage motor.

Space Generations

The Seasoned Workforce



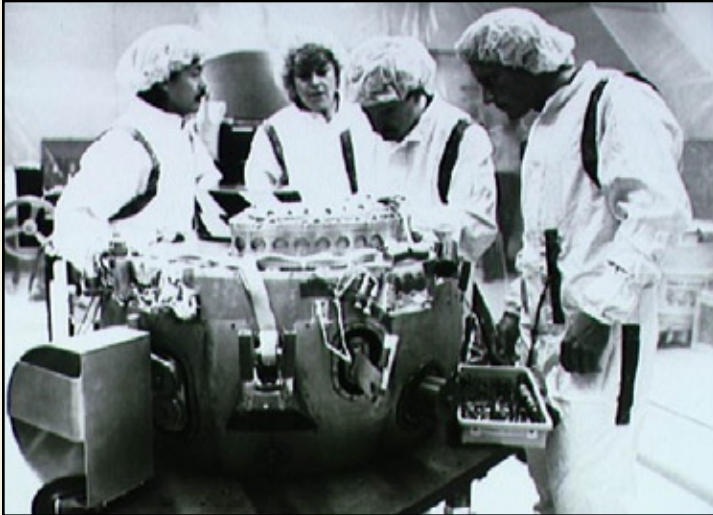
**Is the end of the shuttle program also the end
of the road for our workforce veterans?**

In the early years of the transition effort, much focus was placed on the “what, when, where and how” of moving from one program to another. But as we approach the final year of the Space Shuttle Program, *Rendezvous* is turning its focus toward the “who.” For all of the diversity found within the shuttle workforce, one of the most intriguing categorizations is generational divisions. From Boomers all the way to Gen Y-ers, the shuttle workforce is as varied and complex as the work they do.

In the next several issues, *Rendezvous* will be taking a closer look at the three different generations that have collaborated together to fly into history. And, as with any good story, it’s best to start at the beginning.

Back in the last century

In 1972, the same year NASA completed the last of the historic Apollo missions that had captured the hearts and imaginations of millions and solidified America as the leader in space, President Richard Nixon cast a new vision for human spaceflight. The goal was to revolutionize transportation into near space and to reduce the high cost of astronautics through the use of a reusable shuttle.



Preparing the Galileo Jovian Atmospheric Probe prior to its deployment during STS-34 in October 1989.

In 1974, work began on the first orbiter. A generation of workers inspired by the early days of the U.S. space program – and who cheered loudest during the space race – took the baton and began the next leg of the relay.

Over the course of the last three decades, this generation has been right there with the shuttle through everything. They held their breath during those early flights, testing the gliding and landing capabilities of the shuttle and during the first flight of Columbia with its two-man crew. They were part of several historic firsts, including the first woman astronaut and the first black astronaut. And this generation stood watch for the lows, as well. They mourned together as Challenger, the same orbiter that carried Sally Ride and Guion Bluford Jr. into the history books, was lost on that January morning in 1986. Then, dedicated to the vision, this generation returned to flight in 1988.

Should I stay or should I go?

As the Space Shuttle Program winds down, many within the NASA community are trying to figure out where they want to go next.

For many, the announcement of the shuttle retirement has meant thinking about their own retirement plans.

For others, retirement is still a distant plan by either choice or necessity. So, it's not a question of "Should I retire or not?" Instead, the question is "What am I going to do next?" Vicki Call, an insulation component design engineering manager for Alliant Techsystems (ATK), finds herself asking just that. Though Call is concerned about uncertainty, she is absolutely certain that human spaceflight is a worthwhile endeavor and one she is certain that she wants to be a part of.

"I have always thought that our country would promote and sustain a manned spaceflight program of some kind, whether it was the Space Shuttle Program or something new," Call said. "And I have always thought that ATK would be an integral player in that program. My career plan has been to continue supporting manned spaceflight until the day that I choose to retire. It's challenging, fun and brings personal satisfaction."

"My plans have not changed at all," Call said. "Although the economy is changing, I think the Vision for Human Spaceflight is exciting and potentially holds many opportunities. Our work has diversified from the current Space Shuttle Program to include the Ares I and Ares V projects. My plan is to fly out the Space Shuttle Program and to transition into the work of the future."

One of her biggest goals is to help the people in her department see the potential that the future holds and to help them realize the challenges and satisfaction that they can receive by being an integral part of the work.

This sentiment is just as prevalent on Florida's Space Coast, as expressed by Jeff Wheeler, an engineer at Kennedy Space Center and a 36-year veteran of the space industry. Though the end of the shuttle program is bittersweet for him, he understands the greater goal. For Wheeler and his



President Ronald Reagan communicating with the STS-2 crew, astronauts Joe Engle and Richard Truly. Pictured with the president are astronaut Terry Hart, NASA Deputy Administrator Hans Mark, NASA Administrator James Biggs, Johnson Space Center Director Chris Kraft. Seated next to the president is CAPCOM, astronaut Daniel Brandenstein.



Drs. William F. and Anna L. Fisher seated at the CAPCOM console in the Mission Control Center at Johnson on the final day of STS-8.

generation, exploration is what inspired them to be a part of the effort in the first place, and that objective is more important than any one program.

"It's sad that we are coming to the end of the shuttle program, but it's exciting that we are doing new things," Wheeler said. "It's going to allow us, as an agency and a nation, to show leadership in space by leaving low Earth orbit and hopefully benefiting mankind. I've always planned on being involved with the shuttle program until it ended, and I plan on playing a part in helping KSC support the new program."

Jeanne Kellar, who has worked with Stennis Space Center's central engineering files through both Apollo and shuttle, has decided to stick around to see what's next.

"I knew there would be another program to replace shuttle, and when I found out about Constellation, the modifications for the A test stands for the J-2X and building a new test stand, I wanted to be a part of this third phase for Stennis," Kellar said.

Passing the torch

As the veteran shuttle workforce approaches retirement, the agency is faced with the reality of losing valuable experience and knowledge, which doesn't come from the classroom or from a textbook. It comes from years of personal investment and dedication to the shuttle program.

In an effort to retain this wealth that comes from so much experience, several centers and contractors have instituted knowledge retention and mentorship programs.

As the veteran shuttle workforce approaches retirement, the agency is faced with the reality of losing valuable experience and knowledge ...

"Every new engineer is assigned a seasoned mentor who trains, encourages and coaches for several years," Call said of her department at ATK. "It has been our experience that those relationships carry on and branch out to other engineers as the newer engineers gain experience and confidence."

ATK also has a wide range of experience within their group — seasoned engineers with about 20-plus years and younger engineers with three to five years under their belt — and not a lot in between. One of the keys to their company's future is the transfer of knowledge to the less-experienced engineers, maintaining the investment made and the experience garnered from the program. They consciously set goals and work on that knowledge transfer through work assignments, mentoring, databases and file sharing.

Even as work is being completed, many are pulling double duty to not only handle their own tasks and assignments, but to also pass on their knowledge to others who will pick up where they leave off.

From preparing materials and classes to one-on-one mentor relationships, every effort is being made to ensure that this generation will leave tools behind for their successors.

"I am working with and mentoring others, helping early- and mid-career engineers with their personal skill development objectives and long-term career plans," said Bill Mitchell, an engineer at Pratt & Whitney Rocketdyne (PWR) in West Palm Beach, Fla. "In the past I have contributed to the space shuttle main engine program's knowledge capture initiative. Currently, I am supporting PWR's retention and capture of critical technical information related to the high pressure turbopumps."

With all of the effort and focus being placed on retaining the years of valuable experience and knowledge gained from multiple careers all in the same program, future generations will be able to glean from and build on this vast pool of talent.

Grading transition

While the scope and breadth of this transition hasn't really been seen since the Apollo-to-shuttle transition, being a part of any organization for almost three decades means seeing a fair amount of change. Part of what makes the shuttle veterans so unique, is that they've experienced many smaller changes and transitions. Some were here for transition more than 30 years ago, while others were part of programs that were cancelled. All of them have seen firsthand how the agency and its programs have handled change.

One of the most obvious changes has been in the realm of technology. In her work, Kellar uses databases to sort, collect, document and recall information, but it wasn't always this easy.

"The difference with this [transition] effort is the computer technology, which makes it easier," Kellar said. "With the Apollo Program and part of the shuttle program, we had the information in books and you had to search page by page."

Not only is sorting and searching for information different, but maintaining it is also more of a priority than ever before.

"It seems that in the more recent years there has been a heightened awareness of the need to mentor and share expertise, both for the retention of knowledge and the retention of young, bright engineers," Call recalled. "The things that we are now attempting to do are far superior to the lacking practices of the past."

Part of what will make this transition a success, is not just the important task of laying a strong foundation for the next program, but also successfully finishing what was started and flying the remaining Shuttle missions out safely.

A word from the wise

There is much to be said for listening to the advice of someone who has been there. With 20 or more years under their belts, the shuttle's veterans know what it takes to have a rewarding career and leave a lasting legacy. When asked what advice they would pass on to those still early in their careers, there was no hesitation. The advice of this generation is as practical and steadfast as they are.

"Know how your organization works, formal and informal," advised James Moorhead III, an engineer with United Space Alliance. "Learn as much as you can about the project you are working on and develop your people skills to allow you to effectively communicate what you know."

"Take charge of your career and get involved!" Call urged. "Don't just wait for it to happen. Study the government agencies and companies that are involved in human spaceflight, and go after those jobs. Second, have an aggressive work ethic – take on the challenges and opportunities to participate in solving key technical issues. And don't be afraid to try new things – they might be our future!"

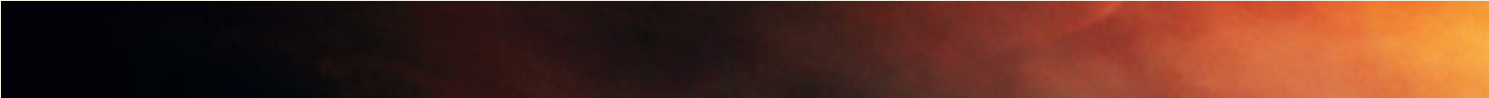
"Try to pay as much attention to detail as they can," Wheeler said. "That's what has got us where we are and what's going to get them where they need to be. They need to be focused on the things they can control and not the things that are out of their control. That's the best thing they can do for themselves and the agency."

**Part of what will make this transition a success,
is not just the important task of laying a strong
foundation for the next program, but also
successfully finishing what was started.**

Achieving longevity

According to a study by the U.S. Bureau of Labor Statistics, American workers today change jobs once every five years on average. The days of starting with and retiring from the same organization seem to be a thing of the past, as more people make the decision for any number of reasons to pursue new careers. Career change is a reality for most people today, but it doesn't necessarily have to be. Over the course of decades within the Space Shuttle Program, there's an entire generation's worth of direction on how to have a long and fulfilling career, all in the same place.

"I believe that if you demonstrate that you are the best, there will always be a place for you in the program," Call said. "It might change direction, but those who are flexible and willing to transition will be able to maintain a presence. The key is to hit your targets with the best of outcomes. Be willing to take on the challenges and recognize and seize the opportunities for growth amidst the change."



As the agency undergoes these changes, the seasoned workforce seems to have a unique understanding of how to navigate them.

“The career path options into other launch vehicle and spaceflight work are very much dependent upon decisions that are forthcoming relative to our nation’s spaceflight and space exploration goals and objectives,” Mitchell said. “One piece of advice that always applies is to continue to learn and develop new skills through continuing education, temporary job rotations if available, and on-the-job training opportunities.”

As the agency undergoes these changes, the seasoned workforce seems to have a unique understanding of how to navigate them.

Steve Glover, a transition lead at NASA’s Marshall Space Flight Center, offers another piece of advice that is always applicable.

“Be flexible, and sharpen your skills so that you’re able to work in more than one area,” Glover said. “Try to find a path forward.”

Seeing it through to the end

Encompassing more than half of NASA’s history, the Space Shuttle Program has continually met challenges and surpassed its expectations. Much of that success, if not all, is due to a generation of men and women who have devoted themselves tirelessly for nearly 30 years.

In that time, they have demonstrated the kind of dedication, innovation and resourcefulness that has become a benchmark for the entire agency. Their unwavering focus on the safe and successful completion of mission after mission has never faltered and has left a legacy that all future generations will aspire to meet.



Challenger’s first launch (STS-6).

Generation Timeline: The 1970's and 1980's

As *Rendezvous* takes a look at the generations that comprise the shuttle workforce over the next three issues, we'll also look back at some of the events, shuttle-related and otherwise, that marked the path to where we are today.



1972, January 5 – Richard Nixon announces the intent to develop the first space shuttle for travel into space.



1972, December 12-19 – The Apollo 17 was the last mission to land on the moon, the last of the Apollo program and the first to fly and astronaut-scientist.

1978, July 25 – The first test-tube baby is born in England.



1980, December 8 – John Lennon is assassinated.



1981, April 12-14 – The first space shuttle mission (STS-1) is designed to test the vehicle by sending it to orbit and landing safely. The mission is a success and starts a new era in human spaceflight.



1981, November 12-14 – The second shuttle mission (STS-2) is the first to carry a scientific payload: a number of Earth-sensing devices. It's also the first time the remote manipulator system or robotic arm is successfully used.



1982, November 11-16 – This mission (STS-5) carries the shuttle's first four-person crew and is also the shuttle's first operational mission, deploying two commercial communications satellites.



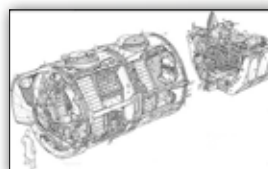
1983, March 23 – President Ronald Reagan proposes his Strategic Defense Initiative, also known as "Star Wars."



1983, June 18-24 – Sally Ride becomes the first American woman to fly in space. This is also the first shuttle mission (STS-7) to fly with a five-person crew.



1983, August 30-September 5 – The first African-American, Guion S. Bluford, flies in space. This is also the first shuttle mission (STS-8) with a night launch and night landing.



1983, November 28-December 8 – The first six-person shuttle mission (STS-9) and the debut mission of Spacelab, an orbital laboratory housed in the orbiter's cargo bay.



1984, August 30-September 5 – Charles D. Walker becomes the first non-astronaut to fly on a shuttle mission (STS-41D), acting as NASA's first shuttle industrial payload specialist.



1984, October 5-13 – This mission (STS-41G) marks a number of milestones: the first seven-person crew, the first shuttle crew to include two women and the first spacewalk by a female astronaut (Kathryn Sullivan).



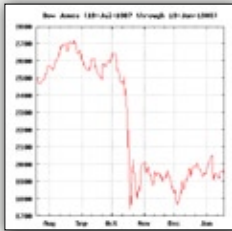
1985, July 13 – Billed as “the day music changed history,” Live Aid concert raises funds for famine relief in Ethiopia, and features over 75 of the most popular musicians of a generation.

1986, January 28 – The Challenger orbiter and the STS-51L seven-person crew are lost when it explodes 73 seconds after liftoff. One member, Christa McAuliffe, would have been the first teacher in space. The explosion is later determined to be caused by an O-ring failure in the right solid rocket booster. The accident forces an immediate suspension of the shuttle program.



1986, February 9 – Halley's Comet passes Earth on its approximate 75 year orbit.

1986, April 25 – The Chernobyl nuclear power plant explosion kills 30 people, 28 from radiation exposure. As a result of the high radiation levels in the surrounding 20-mile radius, approximately 160,000 people had to be evacuated.



1987, October 19 – On what was called “Black Monday,” the Dow Jones Industrial Average drops 22.6 percent in one day, the largest single day drop in history.



1988, September 29-October 3 – Return to Flight. The first shuttle mission (STS-26) after the Challenger explosion launches 32 months after the accident. The five-person crew successfully deploys a satellite and performs numerous experiments.



1989, April 15-June 4 – The Tiananmen Square protests were a set of national protests in the People's Republic of China, which ended with the declaration of martial law and protestors being forcibly removed from the square.



1989, November 9 – The Berlin wall is torn down, joining East and West Berlin for the first time in more than 25 years.

Moving Forward

Suiting up for Constellation.



One would think that a spacesuit is a spacesuit is a spacesuit. One would be mistaken.

Today, spacesuits, like any human spaceflight system, are meticulously designed, developed, engineered and tested equipment. They have to meet specific requirements and they have highly specific use criteria, including protecting and preserving the life of the astronaut living and working in it while exploring space.

But spacesuits weren't always quite that complicated.

At the dawn of human spaceflight, NASA's spacesuits were mostly high-altitude pressure suits designed for use by U.S. Air Force test pilots, but customized and adapted for orbital wear. Back in the days of Mercury, the spacesuits were needed only for launch and entry. It wasn't until the Gemini program that the agency needed a spacesuit that could go outside the capsule — a spacesuit that could go for a walk.

In 1965, the Russians (the Soviets back then) beat us to the punch when cosmonaut Alexei Leonov made the first tethered spacewalk in his Berkut spacesuit during the Voskhod 2 mission. That's the same year Ed White wore the first extravehicular spacesuit, known as the G4C, we'd see on an American astronaut when he stepped out during the Gemini 4 mission. These early suits were still based on the X-15 high-altitude pressure suit used for both launch and entry and limited extravehicular activities as well. They got the job done, but, when pressurized, the suits didn't offer the astronauts much mobility, flexibility or comfort.

Fast forward 15 years into the very beginnings of the shuttle program and the suits hadn't changed all that much. The familiar orange launch and entry suit known as the advanced crew escape suit, or ACES, was still basically a pressure suit designed to protect the astronaut in the event of sudden depressurization. The materials used in building the shuttle program's off-the-shelf spacesuit were more sophisticated, more comfortable to wear and offered more mobility, but weren't designed or appropriate for extravehicular activity — or EVA for short.

Today's extravehicular mobility unit, or the EMU, is much more sophisticated than the G4C suit that protected White on his first-ever spacewalk. The entire suit can weigh more than 300 pounds when fully loaded with all its life support and other mission-specific systems. That's not a problem when worn in zero gravity, but consider the operating environment of the lunar surface at one-sixth gravity. At a minimum 50 pounds lunar weight, plus the environmental control and life support systems necessary for lunar surface operations, today's EMU would still prove too heavy and restrictive for astronauts living and working on the moon for months on end.



Gordon Cooper, one of NASA's Mercury Seven, in his Mercury Flight Suit (1959).

**“Consider also that the suits designed back
in the last century were never intended to
last more than a dozen missions or so.”**

Consider also that the suits designed back in the last century were never intended to last more than a dozen missions or so. At about three spacewalks a mission, that's maybe 30 to 40 spacewalks over the years, and with plenty of time for servicing on the ground between them. The people planning for missions on the moon envision an EVA every other day — maybe 100 or so over the course of one six-month mission. Spacesuits designed for the lunar surface will need to be much more durable, longer lasting, easily maintained and repairable on site.

These are just a few of the challenges facing the EVA Systems Project Office and the Constellation Spacesuit System contractor team led by Oceaneering International.

New materials, common components

Then there's the considerable difference three decades of technological innovation makes on spacesuit materials.

“We've got everything from materials with embedded sensors and on-suit radiation-hardened electronics to breathable, stronger, lighter-weight, more robust materials bonded with new adhesives,” explained Jim Buchli, vice president and program manager of Oceaneering Space Systems. “And that's exactly what Constellation and this suit system will need to be — more durable, lighter and interchangeable.”

Although required for different environments, the new suit system will feature two configurations that will share many of their basic elements or components, as well as some of their materials. This commonality will not only provide a large measure of interchangeability, lessening the upmass/



Jim Buchli, retired astronaut (STS-51C, STS-61A, STS-29, STS-48), now VP/Program Manager for Oceanering Space Systems

desire is essentially, “the more commonality, the better.” But reality has a way of intruding on all best-case scenarios, particularly in the realm of space exploration. Undoubtedly, there will be issues with sizing and the need to accommodate very small to very large people. Astronauts don’t come in one size.

So building commonly configured, technologically advanced, comfortable suits for Constellation’s astronauts is a lot more complicated than most would imagine. And comfort really is key. One moon-bound scenario has the crew in the Configuration 1 suit for as long as 144 hours.

Every new system has its challenges

In the two-suit Constellation Space Suit System, Configuration 1 will provide the same service and protection for the crew member during ascent, entry and abort as does the ACES suit, but with an added capability to handle contingency, umbilical-based spacewalks, which would require a certain amount of reconfigurability. The Configuration 2 suit will be designed for extravehicular activity on the lunar surface – an entirely different environment than the zero gravity conditions of low Earth orbit.

According to Kearney, another key difference between shuttle-era spacesuits and the CSSS (and a very real challenge for the system developers) has to do with the Orion’s environmental control and life support systems. These systems will be quite different from that of the shuttle and the new suit configuration will need to integrate seamlessly with them.

To put this in some perspective, think of the technological improvements in Earth-bound heating, ventilation and air conditioning systems over the last 30 years. When replacing an old system with a new one, chances are good that the connections, hoses, electrical supply, ducts, venting, thermostats, etc. – in effect, the entire infrastructure that supports the main system – will need to be replaced with safer, more efficient, compact and compatible, programmable components.

Another critical difference between suit systems is how they handle consumables, such as the water used for cooling, the battery power, the oxygen, the carbon dioxide scrubber, etc. The improvements in handling the consumables will help make the consumable impact much lower for the CSSS, and thus lower the mass of the suit, particularly the Configuration 2 suit.

“A primary challenge is to decrease the mass of the suit while increasing its mobility characteristics,” Kearney explained. “Today’s EMU is a lot like the shuttle. It’s a beautiful machine for what it is and what it does, but it’s 30-year-old technology. So we’re incorporating many of the technology advancements we’ve made in 30 years into the new suit system.”

In addition to solving the issues associated with commonality, the constraints of weight and volume and more than three decades of technology improvements, Buchli referred back to the fact that both the CSSS and Orion are development programs. That means getting a fix on all the integration issues between the Configuration 1 suit and Orion’s environmental control and life support systems is difficult. In effect, that set of requirements, although established, is still evolving.

downmass requirements to maintain the suit systems, but it also simplifies the procurement process. After all, single contract programs are far easier and less expensive to manage than multiple contract programs.

There is still a wrinkle in this approach, as Lara Kearney, Constellation’s EVA Systems Project manager, pointed out. The requirements for the intravehicular suit – called Configuration 1 – in which the crew member would be strapped to a seat on ascent and entry, are very different from the requirements of the extravehicular, lunar surface suit, Configuration 2. So how much commonality can there really be?

“The hardware may look different, but certain components such as gloves, neck rings and helmets may be the same,” Kearney explained. “However, the hard joints that are necessary for mobility on the lunar surface are not appropriate for being strapped in a seat. You can’t get secure enough in the seat, and you certainly don’t want all that metal potentially hurting you on ascent, entry or abort.”

Buchli added there was some uncertainty as to how much commonality the two configurations would actually share in the end. He said that the program’s



Intravehicular Configuration 1 suit on the left and extravehicular, lunar surface Configuration 2 suit on the right.

“A primary challenge is to decrease the mass of the suit while increasing its mobility characteristics”

“We’re wrestling with the amount of flow – oxygen or air flow – that we get from the Orion to our suits,” Buchli explained. “How much do the astronauts need? How much can be provided? What kind of pressure drop can the astronauts live with? What can be accommodated? Those are all development issues.”

Accommodating suggestions from the field

In the Inauguration Day parade in the nation’s capital early this year, the world got its first look at a lunar electric rover and low-fidelity prototypes of a lunar surface extravehicular mobility suit. Buchli is careful to emphasize that these “demonstrators” were not developed by Oceaneering and that they were fabricated for conceptual operations only. Their purpose is to make it possible for engineers to simulate lunar missions in field exercises here on Earth, to help determine the kind of equipment that will most likely be required to live and operate on the moon.

“As they identify needs or deficiencies in doing these exercises, they feed that data back to Lara [Kearney] and the engineering director in the EVA Systems Project office,” Buchli said. “Then if there’s something in there that represents a risk that can be mitigated, we do the risk reduction activities to take that into account as we build the Configuration 2 suit.”

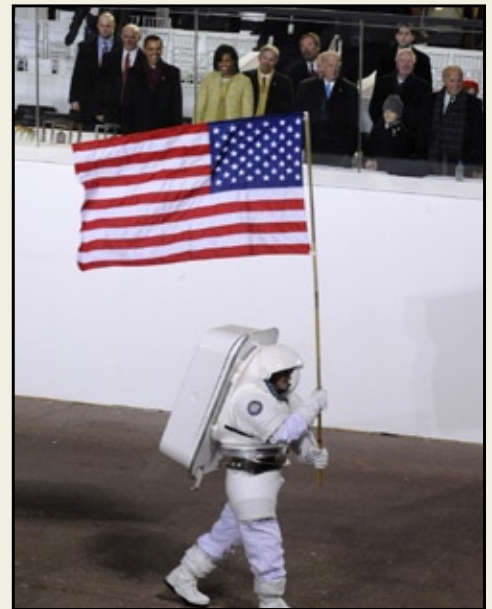
A select few, all experts

Despite the current challenges ahead of the CSSS team, both Kearney and Buchli are optimistic about the project’s progress to date.

“The one luxury we have is that we’ve been building suits for a long time and will continue to build and support suits throughout the life of the space station,” Kearney explained. “But with Orion, it’s different. We haven’t built a vehicle for a long time, so a lot of people on the vehicle side are having to do this for the first time.”

The fact is, most of the people in the CSSS project also worked the EMU suit for shuttle and station EVAs.

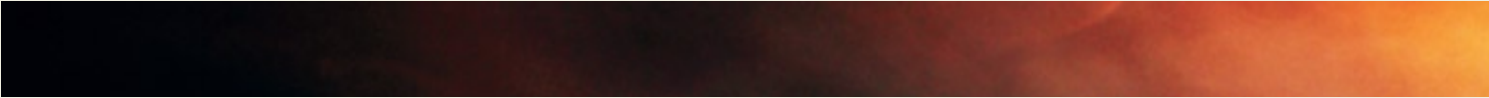
One might almost – but not quite – think of the CSSS as an evolution of the existing ACES and the EMU. Kearney maintains that the CSSS project has a distinct advantage in that they have a wealth of lessons learned that can be carried forward from the existing EMU program and included in the requirements and contract specs to “set things up” for the new project. But integration with Orion will require the accommodation of a lot of brand new ideas as well.



The Lunar Surface Extravehicular Mobility, or LSEM Suit in the 2009 Inauguration Day Parade. The suit shown is a low-fidelity prototype and not the CSSS.

... The CSSS project has a distinct advantage in that they have a wealth of lessons learned that can be carried forward from the existing EMU ...

Buchli makes the point that it’s not like there’s an unlimited number of contractors out there who know how to develop, design and build spacesuits. The contractor team led by Oceaneering, known as the C-SAFE team (short for Constellation Spacesuit Accommodation For EVA), includes most of the companies that have legacy experience building spacesuits and suit components. With Oceaneering as prime, the C-SAFE team includes Honeywell International, David Clark Company, Paragon Space Development, Cimarron Software Services, Hamilton Sundstrand,



Harris Corporation and ILC Dover. Furthermore, they are familiar with one another, having worked together or competitively for decades. In fact, they've embraced just about everyone who has had any experience in building spacesuits — including their customer.

"We've cultivated a very close-knit team," Buchli said. "Not just on the contractor side, but also with our NASA counterparts, so we have a very integrated approach that uses existing NASA research to get to where we are today."

A critical system

To both Kearney and Buchli, and certainly to the Constellation astronauts who will be relying on the CSSS configurations to keep them safe, capable and comfortable, these spacesuits are as critical as any system, hardware or otherwise, that's required for human spaceflight. Buchli explained that the spacesuit, whether needed for ascent and entry or lunar surface extravehicular activity, is a critical element that contributes to the success of the mission. Furthermore, he's a firm believer that this CSSS design effort is the first step on the path to Mars.

**“The Spacesuit is a critical element ...
that contributes to the success of the mission.”**

"What is learned on this suit and this system will go a long way in helping us operate on other planetary bodies," he explained. "We're building a suite of hardware that will allow us to do human space exploration. In the end, if we don't have the right kind of suit, we won't be able to do what we need to do."

And to do what we need to do, we'll definitely need to step outside.



Stepping outside the station

Shuttle retirement does not spell the end of extravehicular activity support from a Space Operations Mission Directorate (SOMD) perspective. In fact, explained Lara Kearney, Constellation's EVA Systems project manager, of the 20+ people from JSC's EVA Office who are engaged on EVA Systems for SOMD, only two of them are shuttle-dedicated. The rest are responsible for all station-based EVAs and are charged with maintaining the EMUs currently deployed, keeping them in working condition to support all station spacewalks through the life of the station. Even after the Orion capsule begins serving the station, the EMUs will remain in use.

**Dave Pitre prepares his students and his team
for today's missions and tomorrow.**



Teaching Spaceflight and Transition

Back when a career wasn't exactly on the top of his mind, Dave Pitre thought he'd follow in his father's footsteps and become a farmer after his stint (also just like his dad's) in the U.S. Air Force. The last thing he thought he'd wind up doing was teaching. But that, in effect, is what he does.

As a simulation supervisor, Pitre teaches astronauts and flight controllers everything they need to know.

But he hasn't completely given up on the idea of farming, either. Pitre is responsible for raising a highly specialized, well-trained and ultra-capable crop of program participants — and he's been doing it for years. He started out with the shuttle program before it started flying back in 1981, and he's been a training lead for integrated astronaut, flight director and flight controller training at Johnson Space Center since 2001.

As a simulation supervisor, or sim-supe (pronounced "sim-soop"), employed by United Space Alliance at Johnson Space Center, Pitre is responsible for orchestrating all the human interaction of entire missions. He starts his pupils out with generic training not associated with a particular flight, and then progresses into mission-specific training. In fact, the last thing a crew will do before their actual flight is train with their specific mission control team and do a full simulation. Then they head for Kennedy Space Center and the launch pad.



Inside the Motion Based Simulation at Johnson Space Center.

"I put together a script," Pitre explained. "The script covers all the tasks that the astronauts, the flight controllers and the flight director need to know to do their jobs."

The scripts cover emergency procedures, nominal procedures and mission-specific procedures. Pitre's scripts document the gritty details and the actions they'll require, such as what's in the payload bay and what the crew will need to do with it; what it will look like when they get to the International Space Station; and what they will need to unload and stow.

"It's kind of like a play, and I'm the producer," he elaborated. "I sit on console. I have my team of instructors, and we choreograph what we want the crew and the flight controllers to see and the problems we want them to deal with."

The point is to rehearse every situation they might encounter so that when it happens for real, there are no surprises. Surprises, of course, are not good things in space.

"We train for major contingencies, such as rapid decompression," he explained. "We want the flight controllers and the crew to be able to act without having to take time to think."

Obviously, when something happens on orbit, time is of the essence. There's no time to improvise or troubleshoot on the fly, so to speak, so everything is well rehearsed and processes are worked by the book.

From dreams of farming to training crews for space missions, Dave Pitre's progress through the shuttle program has been an adventure he wouldn't trade for anything in the world. And now that the end of the shuttle program is closing in, he's looking forward to a new spaceflight adventure. Hopefully, one that will have a place for him and his team.

A familiar, although uncertain, landscape

Pitre's earlier years in the shuttle program included a transition involving a major layoff at Palmdale. This prior experience with drastic change has led him to embrace his responsibility to lead his team and the people he works with through the coming changes. He wants to help them avoid discouragement, retain the right attitude and not get complacent about the program or their futures.

"Rumors are rampant," he explained. "You hear things that make you roll your eyes because they're so absurd. People are just making things up to fill the void because nobody knows what's really going to happen."

Pitre goes out of his way to keep his people's interest piqued in the work in front of them and focused on their larger responsibilities to the mission they're assigned. He tries to dispel the rumors he hears. He emphasizes that there's still plenty of work left to do and they can't afford to get distracted. That's when bad things happen.

But he can't ignore the fact that his employer has already announced that they're facing a significant reduction in workforce — as much as 50 percent for Pitre's level. He knows that they can't absorb 50 percent through retirement or attrition.

"The reality is someone's got to go," Pitre admitted. "What I'm trying to do for my people is explain the reality to them and suggest what they need to be doing right now so they're not caught off guard when the time comes."

Start with the simple, obvious things, Pitre recommended. Update the old résumé. Start checking out various online job listing sites, and not just the NASA, space program contractor and related aerospace sites, either. Pitre said that it's important to get a really good sense of what's out there in other businesses, too. Because when the time comes, if you don't understand the available employment universe, it'll already be too late.

“They’re not going to lead you by the hand down this path,” he said. “It’s going to hit like a brick when the time comes and you realize, ‘I don’t have a job anymore.’ So you have to prepare yourself for that day.”

That’s not to say, however, that Pitre isn’t doing his best to help his people along.

“I try to educate them about where we are [in the transition phase],” he said. “I say, ‘OK, we’re one step closer [to shuttle retirement],’ and basically try to filter down information they can use to make the wisest, informed decisions about their futures.”

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Pitre also has the advantage of having worked on several of USA’s Constellation proposal teams, so he knows what the space program’s workforce objectives are in terms of numbers and how that compares with today’s shuttle workforce. Obviously, it’s not a blanket 50 percent reduction across the board. It could never be that straightforward.

“In some cases, you’ll lose as much as 90 percent of the folks working a particular job because it’s so shuttle specific,” he explained.

The design and operational differences in flight hardware between the Space Shuttle Program and the Constellation Program are significant. And it’s the same in Pitre’s realm of flight simulation and training. For example, Constellation will likely not have much early orbital extravehicular activity or robotics in the program, so those folks will feel the pinch “in a hurry,” as Pitre said. But there are others who are needed now and will be needed later, too.

“I just try to use my own experiences and filter down the good information and dispel the bad so that transition won’t be quite so hard for people to get through,” he explained.

He’ll never forget what it felt like when it happened to him in Palmdale.

“I was devastated,” he remembered. “I thought, ‘Do I want to do this anymore?’ I even contemplated a career change. But I survived that one, and I came back to work in the program again because I remembered how much I liked working in the space business. I really do. I’m glad to come to work everyday. Other than that one time, I’ve never doubted my commitment to the program or given a thought to changing jobs.”

Based on that experience, he pushes his people to be prepared.

“You’re going to survive this,” he tells people. “And if you still want to work in the business, you can. It might not be right away, but you’ll find a way.”

If you keep at it. If you’re open to opportunity. If you’re willing to work hard for it. He knows because that’s how he did it.

Wings over the South — and the West

Dave Pitre was born in Springfield, Mo., while his father was in the Air Force. But by the time he turned 1 year old, his father had left the service and moved the family to Santa Fe, Texas, between Houston and Galveston, to be close to kin and to resume the family business — farming. Santa Fe is where Pitre remained until he, like his father, entered the Air Force in 1970.

“I really intended to follow in my father’s footsteps and come back to farming after my time in the service, but Uncle Sam had a different plan for me,” he remembered.

He was stationed at Keesler Air Force Base in Mississippi for his first tour, and at George Air Force Base in California for his second. By the end of his second tour, things had changed in the Air Force, not just for Pitre, but also for a lot of people in the service.



Orbiter prototype Enterprise separating from 747 Shuttle Carrier Aircraft for approach and landing test research.

"In 1979, the Air Force was ramping down," Pitre related. "The Vietnam War was over and they weren't offering promotions. The outlook was pretty bleak for anyone thinking about a military career. So I started to shop around."

Fortunately for him, George Air Force Base (decommissioned in 1992) was near Edwards Air Force Base where NASA was conducting the approach and landing tests of the shuttle test vehicle, Enterprise. Pitre saw two of the test landings at Edwards, and he was already star-struck by the moon landings and "the whole space thing" back when he was in high school in Texas, just down the road from the Johnson Space Center. It turned out that getting to see the approach and landing tests at Edwards, plus the reality of facing a necessary career change, were more than enough motivation for Pitre to try to gain a foothold in the space program.

He applied for jobs in two locations — a manufacturing job in Palmdale, Calif., where they were building the orbiters; and in Houston at Johnson Space Center, where he knew the landscape.

SAILing for NASA

"I came down to Houston on a trip and just shot-gunned everyone that had anything to do with the Space Shuttle Program, NASA and contractors," he said. "I knew I wanted to get involved in operations, if I could, because that's what I was doing in the Air Force, and it's not just a desk job. It's dealing with the daily operations of a program. It's flying airplanes. Or, in this case, it's flying shuttles."

Rockwell was hiring test engineers for the avionics maintenance and integration lab, now called the Shuttle Avionics Integration Lab, or SAIL, and Pitre considered himself lucky to be one of them. It was 1979. The first mission wouldn't launch for another two years, but Dave Pitre had a job in the space program.

By the end of 1982, Pitre had applied for a position in training. It was a promotion, and he got it. The differences between working in the SAIL and in training were night and day.

"The SAIL was technical; I didn't deal with people hardly at all," Pitre remembered. "It was all about testing boxes and software and making sure that things behaved like they were supposed to. But when I came over here, it was just the opposite."

He hadn't completely left the technical world, but now he was working with people, training crewmembers and flight controllers to operate the shuttle. He had never done any instructing before and didn't know exactly what to expect. He wasn't entirely sure he had the innate skills the job required.

"It's something you're born to do, or you're not," he said.

Fortunately, for Pitre, he found his niche. He understood the technical side of the subject he was teaching, thanks to his stint at SAIL, so it was easy for him to pass the knowledge on. He also discovered that he was naturally skilled in communication, as most good teachers are.

Back to the high desert

Like most careers spent in the shuttle program, Pitre's had its share of twists and turns, starts and stops. It's the latter experiences that qualify him to counsel his people and prepare them for the end of the shuttle program and the transition into new objectives.

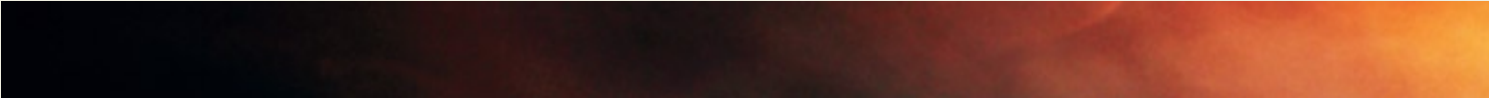
"I was here when Challenger happened, and that was a two-and-a-half-year stand-down," he remembered. "After the accident, the program decided to replace that orbiter, and Endeavour was funded. The problem was that many of the people who had built the original orbiters were either retired or dead."

So Rockwell put out a call for experienced shuttle people to come back to help build Endeavour. Pitre sent in his résumé, received a good offer, accepted it and moved back to California's high desert to become a test engineer again, this time on a real vehicle. He even bought the house he had rented when he was stationed at George Air Force Base in the late 1970s.

"I spent three and a half years, from 1987 to July



The roll-out ceremonies for Endeavour (OV-105) at the Rockwell International Space Systems Facility in Palmdale, California.



1991 at Palmdale, helping to put Endeavour together,” he recalled. “I was there from bare floor to roll-out.”

And then, just like that, the Endeavour was built and the plans for Palmdale to become the primary site for all shuttle modifications and repair evaporated.

Pitre returned to Johnson to resume his work in training in November 1991 and started working his way up the training ladder to team lead in simulation. As team lead, he was assigned to STS-107, a mission that was delayed a dozen or so times. While he was working the mission, he was promoted to simulation supervisor in 2001, almost two years before it actually flew, never to return.

“That flight was life-changing,” he said. “Normally you start training with a crew six to eight months out and you’re done. With STS-107, we were together with the crew for two years. We knew their families. We did a lot of social things together because our lives were so intertwined. We shared a lot of emotion about the delays we were experiencing. So when the accident happened, it was Challenger all over again — but harder.”

Like many shuttle people who were close to the astronauts and the mission, and many more who were simply committed to the program, Pitre got through the emotionally trying days following the accident by getting back to work. He petitioned his management to allow him to go to help with the recovery effort. For several months following the accident, he joined his colleagues from NASA and other shuttle contractors in the tangled undergrowth of East Texas, gathering debris and striving to put the puzzle back together. Then the program stood down for another two and a half years.

Return to Flight — again

Pitre returned to his job as simulation supervisor through the 2003-2005 Return-to-Flight period, basically putting one foot in front of the other. His team did generic crew training for the most part. Eventually, they started moving back into flight specific training and Pitre’s team took on STS-116, the third mission after the first Return-to-Flight mission.

But even before the first Return-to-Flight mission was certified for flight in mid-2005, the President’s announcement of the Vision for Space Exploration in early 2004 changed everyone’s idea of the future of the space program and their roles in it — and put an end date on the only program Pitre knew.

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A program back on track

Jump ahead five years: So what does the shuttle’s imminent retirement mean to crew and flight controller training at Johnson Space Center? Pitre looks at it with a mixture of excitement and melancholy. When asked how he reacted to the announcement of the Vision for Space Exploration in early 2004, he replied that he was “happy beyond belief.”

“I got interested in this business because it was exploration,” he explained. “I thought going to the moon was the greatest thing. It was science fiction come true. I thought we’d be going back there in my career, and we never did. My whole career, we’ve been flying shuttles around in low Earth orbit, and finally the President said we’re going to finally go do what I always thought NASA should be doing ... I thought we’re back on track.”

It’s when he considers the scope of his career, one that started before the shuttle flew and will shortly see them parked forever, that the sadness creeps in. He remembered feeling much the same way when the Air Force retired the F-105 Thunderchief, a plane he worked on through his two tours. He thought to himself, ‘Here I am going through this again ... It’s coming to an end and it will never fly again.’

Then he thinks of what has been achieved in the 30-plus years he’s been intimately involved in the shuttle program.

“We established spaceflight as a continuing endeavor in a time when the program could have disappeared,” he said. “We established the need for the tradition of men in space, whether it’s for exploration or science or accomplishment. And something that a lot of people don’t consider are all the people, a whole generation, who have trained in math and science to do this work. I work with some pretty tremendous young folks who are just so enthusiastic about what we do and what we’re going to do.”

Which brings Pitre back to the excitement of a new goal.

Following his own advice

Pitre started volunteering for Constellation-related projects as soon as they appeared on his horizon. If it had “Constellation” on it, he wanted to do it. In effect, he followed his own advice to get involved and get ready.

He helped write the proposals for the contracts USA opted to pursue. That experience educated him on what the whole program was about, what it would look like and what kind of crew and flight controller training would be required for a new vehicle and new operations. He’s already deeply involved in trying to figure out how to train most effectively with a streamlined team since the Constellation Program requirements call for fewer flight controllers and fewer instructors. Then there’s the exciting prospect of building a new simulator for Orion.

“We’re trying to figure out what it will need to look like, what we’re going to teach in it, how many crew, how long will the training flows need to be, that kind of thing,” he explained. “I’m trying to get all those skills under my belt so when the time comes, I’ll have something on my résumé that’s Constellation related.”

Pitre is adamant with his team that they try to do the same. He encourages them to look for things they can do to add value to their résumés.

“Just because the shuttle’s got a sunset date and you can see it doesn’t mean that you need to stop taking classes or earning certifications,” he said. “In our world, you always have to prove to someone that you can do that job.”

Especially that job on the horizon.



Pitre and his family, celebrating the Shuttle program.



Simulator smiles

If there was ever any doubt that Dave Pitre doesn't love his work then this episode should lay that notion to rest. Johnson Space Center recently held a "Bring Your Kids To Work Day," during which Pitre and his team gave simulator "rides" to more than 90 wide-eyed, underage, potential astronauts. He shared this experience with Rendezvous after his busy, exhausting and, at one point, hilarious, day. In Dave's own words:



Pitre with one of his pint-sized "students."

"When you're working with kids you never know what they will do, and so it was yesterday. One family of seven kids was scheduled to ride, taking a whole hour in the process. The dad set them up to ride in order of age, oldest to youngest. The last was 6-year-old Becca. Cute as could be – blonde girl with blue eyes and a pony tail. I moved the seat as far forward and up as it would go and used an extra seat pad to boot and still she could barely see out the front window. (I turn simulator motion off for the little ones so I wasn't worried about safety.) Regardless of age or ability, I try to let them fly the landing, making control inputs on my side only if needed, and Becca would be no exception. But, having to strain to see out the window and reach the stick, she figured out a better way. Taking my eyes off the forward visuals to check on her, I found her reclining back in the seat, using her feet to move the stick. Through tears of suppressed laughter, I finally found the power switch for her stick and continued the lesson. And people ask me why I do this every year!"

Weighing In



Normally the Weighing In column serves as Rendezvous' version of letters to the editor. We use feedback from Focus and Brainstorming Sessions we conduct across the country to represent the voice of the space shuttle workforce.

But we can only talk to so many of you at a time, and as the retirement of the shuttle rolls ever nearer, the need for communication increases exponentially. So the Rendezvous team is trying to cast its net a little wider.

With this issue, we're also launching two new tools on the Rendezvous Web site that we hope will help us accomplish that:

The first is the Transition Poll. Every two weeks, when we send out the biweekly Rendezvous updates, we'll ask a new question related to transition and retirement. In just the few seconds that it takes for you to click on the answer of your choice, we'll gather valuable information that will help us go get the information you're looking for.

The second will take a little more time on your part, but we hope you'll appreciate the results. As the shuttle program winds down, now is a good time to start looking back at what it's taken to get here. With our Digital Scrapbook, we hope to provide you with an outlet for that. Write down your best memories and greatest accomplishments and share your lessons learned. You can even post photos, and we plan to expand the capabilities to include video.

In addition to those new tools, we've also improved an old one: the Leadership Blog. It's now set up to allow you to post comments more easily (no password required) and search for entries that interest you. We'll continue to have a different transition leader blog every other week, so if you haven't already, subscribe to Rendezvous to get notices of the update.

And as always, we'd love to hear your comments and suggestions on Rendezvous itself. Just click on the comment button to tell us what you think.